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NOTES AND COMMENTS.

The Excusers of the Preliminary Notice.

WE have at last found a defender for the preliminary notice, and it gives us great pleasure to publish in our correspondence pages the letter sent us by Mr. F. A. Lucas, of the National Museum, Washington. We derive still greater pleasure from the circumstance that this letter gives us the opportunity of exposing the underlying grounds of our objection. We do not wish to deny that under certain conditions, such, for instance, as those to which Mr. Lucas alludes, the publication of a preliminary notice may fairly be called a necessity, but this does not make such publication any the less an evil. In such cases it is the conditions themselves that are in fault, and the preliminary notice is merely, as it were, an attempt of the body to fight against more deep-seated disease.

In the case of our American friends, the disease appears to be of the following nature: we in England, happily removed from the intrigues of politico-scientific placemen, are accustomed, on receipt of the beautiful volumes which come to us from the United States, to fall into a rapture of admiration without always considering how long a time has elapsed between the sending in of the manuscript by an author and the issue of the work by the Government. Those who wish to know the difficulties that are placed in the way of sincere and hard-working investigators may turn to a prefatory note attached by Professor Hall to his handbook of the Brachiopoda in the 11th *Annual Report of the State Geologist of New York*, as well as to a similar preface on p. 602 of the 13th *Annual Report*. It is, we have heard, often the case that, when the proof has been read and the plates printed, important publications are still kept waiting for a year or more, although the additional expense of printing off and binding would be trivial in comparison with that already incurred. We are still waiting for Dr. Brown Goode's paper on deep-sea fishes, and the second volume of Major Bendire's "Life-histories of North American Birds," which we understand were ready for publication a year ago. What the reasons for this and similar delays may be, it would be difficult to

explain; there are, no doubt, plenty of convenient answers to inconvenient questions ready filed for despatch in some Circumlocution Office at Washington—at least, we suppose there is such an office there just as there is at Whitehall. The fear and the experience of such delay is undoubtedly the cause of the extensive production in America of those exceedingly irritating pseudo-publications known as "advance sheets," which the authors are accustomed to obtain from the printers by some method that we are unable to explain, which they distribute to a few favoured friends, and which they rely upon to ensure them the coveted priority. The difficulties in the case are not lessened by the fact that some of these advance sheets are dated, while others are not; the consequence is that the worker of a subsequent generation is constantly puzzled by his dates, and has to waste his time in ransacking second-hand booksellers for these absurd "preliminary notices" and "advance sheets," although the final publications may be standing neatly bound upon his shelves. The distribution of an advance sheet is either publication or it is not: if it is publication, then subsequent publication is nugatory; if it is not publication, it should not be distributed at all.

Another disease of which the preliminary notice is a symptom is this perpetual craving after credit. It is very human, very natural, that a man who has done a piece of good work should dislike seeing the praise wrongfully captured by another; but this, too, is an evil—that people should think so much more of their own self-advancement than of the advancement of science that they should be willing to steal the results of another. Instances of this that have come to our knowledge from America, although we do not mean to say they are confined to that country, force us to believe that there are some people who are men of science first and gentlemen afterwards. It is not likely that either science or their own reputation would be injured if they were to reverse the order; and as for credit, surely there is not so very much credit, after all, attached to the lucky finder or receiver of some new species. True credit belongs to him who works out its structure and affinities with pain and perseverance. Such work is not of a nature to be either accomplished or published in a hurry, and whether the subject of our investigation be blind batrachians or extinct sea-monsters, it is not likely that we shall jump at correct conclusions before accumulating, sifting, and working out a crowd of details. Here let us, to save any suspicion of personality, quote some remarks made by a reviewer in *Nature*:—"The tendency at the present among a certain class of small workers to premature publication and to hasty generalisation, leads to most disastrous results in the accumulation of third-rate literature. A single fact, which often turns out to be no fact at all, is hidden in pages of raw and worthless speculation." Does it not sometimes strike these eager scribes that their work would suffer no harm by being brought nearer to maturity? After all, what they are so anxious to forestall other people with, is

often nothing more than an error, the publication of which they subsequently regret. We have known authors bitterly to resent criticism of such work, on the ground that it was "nur vorläufig"; we have known them calmly to ignore their own published work, flourishing out names and facts as new a year or two later on. As we said of the advance sheet, so we say of the preliminary notice—it is either publication or it is not, and the sooner it is regarded as not publication the better it will be for the world of science.

These remarks obviously apply chiefly to systematic work, to cases where new names and the description of new species and genera are involved. In the happier department of anatomical work the preliminary notice may sometimes serve a useful purpose. It is the newspaper of science and announces to those interested the nature of new discoveries and the lines upon which investigations are being conducted. Take, for instance, the placenta found by Mr. Hill in a marsupial, and referred to on another page of this issue. It is a discovery of the greatest interest, and we are glad to hear of it long before there is time for the preparation and publication of the elaborate figures and descriptions. The preliminary notice in a case of this kind announces a zoological fact, and is totally different from the preliminary notice of the systematist and theorist, inasmuch as insufficient descriptions of new species and unsupported speculations are not zoological facts.

"Premature Births."

An esteemed correspondent draws our attention to the way in which new species are introduced to the world in the *Journal* of the Marine Biological Association of the United Kingdom. On turning to the number issued in February last, we find that Professor C. C. Nutting publishes imperfect descriptions of three new species of hydroids, of which full descriptions with figures are promised to be given in the *Annals and Magazine of Natural History*. Next comes Mr. Bassett-Smith with a number of new copepods, of which "a description, with figures, will be published shortly elsewhere." In the section headed "Faunistic Notes" we find a description, which is certainly more intelligible, but still published in rather too modest a fashion, of a new species of nudibranchiate mollusc, by Mr. W. Garstang. Further on, in a paper entitled "Algological Notes," by Mr. George Brebner, we are introduced to some four names under the form "Batt. in lit.," although it appears from a note at the end of the paper that the names were no longer *in literis*, but had been already published in the *Journal of Botany*. Whether these names be *nomina nuda*, or whether the few lines that follow each of them be intended as a preliminary description, does not very much matter; in eit her case the introduction of new names in such a manner is not to be commended. "It can," says our correspondent, "only be from want of

thought that such a plan is followed in an otherwise excellent journal."

Another letter we have received says: "Most of us must earnestly desire that you will continue your crusade against the 'preliminary notice.' No naturalist can wish to have to study the same thing twice over, first in an incomplete and puzzling form, and a year afterwards in an explanation long drawn out and devoid of freshness." Our correspondent's meaning is well illustrated by some remarks recently made by Professor G. Lindström in a very valuable paper, "Beschreibung einiger obersilurischer Korallen aus der Insel Gotland" (*Bihang. K. Svensk. Vet.-Akad. Handl.*, Bd. xxi., Afd. 4, No. 7). It appears that many years ago Dr. Lindström introduced certain species of Upper Silurian Corals into zoological literature, partly by their names alone, partly with short preliminary descriptions. The consequence has been (and we do not think that the learned author has any right to complain) that many of his names have received at the hands of various authors a wider meaning than he intended, and that many of them have, in fact, been diverted to forms quite other than he originally meant. To the ordinary person it must certainly appear that there would have been far less confusion introduced into a difficult branch of science had Professor Lindström never published these preliminary descriptions at all.

DESCRIPTION OF SPECIES.

IN *Memorias* de la Société "Antonio Alzate," vol. ix., p. 32, Professor Herrera asks three questions, to which he desires full replies. (1) What subjects of study do you know that are more important for natural history than the simple description of new species and sub-species? (2) Synonymy becomes daily more confused: do you know the cause? what is the remedy? (3) Do you think it advisable that the authors' names should no longer be attached to the names of species and sub-species, but rather the date of publication of those names? For example, instead of *Tamias striatus typicus*, Merriam, one would write *Tamias striatus typicus* 25,2,86.

Our readers will have their own answers to these questions, but perhaps we may be allowed to indicate what would be our own. (1) Any subject of natural history study seems to us more calculated to advance science than the mere description of species—species, if they are to be described, should be compared one with another and placed in their proper systematic position. It is only when this is done that the study has any claim to be a branch of science. (2) The causes of confusion in synonymy are two: first, the ignorance, real or assumed, of other people's work that is still displayed by the majority of name-givers; secondly, the incompetent descriptions, often without illustrations, that continue to be published by many people who ought to know better, especially in the form of "preliminary notices," so

that when the literature is found it cannot be understood. As to our remedy, we have already proposed it. We have said, Let the list of species be drafted by a body having some kind of authority, and let the zoologists of the world agree to accept these names and to make the publication of the list the date before which they will not go (*see* NATURAL SCIENCE, vol. viii., p. 218, April, 1896). (3) There are many people, to whom the term speciesmonger certainly can not be applied, who desire to see the name of the author attached to the name of his species, since it suggests to those unacquainted with systematic literature the place in which the original description may possibly be found. On the other hand, there is no room for doubt that it is this continual repetition of authors' names that leads a certain class of minds to suppose that there is some honour and glory to be gained by attaching new names to innocent animals and plants. This vanity is at the bottom of much hurried and imperfect work, the disgusting race for priority, and of the desire to disinter long-buried names. The suggestion that a date should be attached to the name is not open to the same objection as is affixing authors' names, while it is just as likely to be of service to the ordinary naturalist, since he can at once turn to the name in the *Zoological Record* for that year. Of course, it would be impossible to give so exact a date as Professor Herrera gives in the instance he quotes; at the same time, if the custom were adopted, we should probably be better able to insist on authors and editors giving the correct date of their publications, which is at present an exceedingly difficult matter to determine. The suggestion, therefore, strikes us as an excellent one, and we may point out that a slight extension of it might have the further effect of steadying nomenclature, since two names that were the same so far as their orthography was concerned could be adequately distinguished by means of the date. This is, we believe, the very practical plan that is pursued by the Kennel Club, the only condition being that the same name shall not be used twice within five years. If zoologists are not above taking a hint from the kennel and the course, it is possible that in some such suggestions as these we may find a way out of all our troubles.

THE LARVA OF *Leucosolenia*.

WE have received from the Royal Society the sheets of an interesting communication made by Professor Ray Lankester on behalf of Mr. E. A. Minchin. Mr. Minchin is one of the few Oxford Fellows who, instead of making their fellowship the foundation of a quiet domesticity, have spent their time almost continuously in research. The contribution now before us deals with the very interesting amphiblastula larva, specimens of which in all stages Mr. Minchin obtained, in the case of *Leucosolenia variabilis*, at Roscoff. The minute larvæ leave the mother sponge by the osculum, and at once rise to the surface of the water, where they swim for about

twenty-four hours. Thereafter they sink to the bottom, swim sluggishly for a second period of from twelve to twenty-four hours, and then become fixed, and undergo metamorphosis. The newly-hatched larva is a slightly oval body, the larger anterior pole of which consists of a single layer of ciliated cells, each cell being provided with a single long flagellum. The posterior pole has a smaller number of larger and granular cells. Between the two sets is a zone of intermediate cells, which, as Mr. Minchin was able to make out, are transitional stages between the ciliated cells and the granular cells. During the free-swimming larval period the granular area gradually increases by transformation of the cells of the intermediate zone, while the intermediate zone grows by transformation of the adjoining ciliated cells. The centre of the larva is occupied by a mass of pigment, and sections showed that this is part of a remarkable larval organ with pigment, a lens-like body, and central granular cells. It is in fact an eye, or rather a light-perceiving organ of a very simple character. This organ apparently is completely thrown out at the metamorphosis.

The free-swimming larva fixes itself by its anterior pole. The granular cells grow round the ciliated cells, and the metamorphosis is completed in a few hours. The granular cells become a single superficial layer of flattened cells, a layer which Mr. Minchin calls the *dermal* layer, while the interior is occupied by a solid mass of the original ciliated cells, now called the *gastral* layer. These two layers develop independently of each other in their subsequent stages, so that in different larvæ different stages of the dermal and gastral layers may be associated. This seems to us a point of considerable interest, and one upon which an extended set of observations in all sorts of embryos would be useful. For it seems to bear upon the nature of the process of development, and upon the scope of the intrinsic forces which play at least a large part in the elaboration of an individual. The dermal layer gives rise to an inner layer, the cells of which unite into groups and secrete the triradiate spicules, and an outer layer, each cell of which secretes a single monaxon spicule. A split appears in the gastral mass, and around this the gastral cells become arranged in a single layer, except at one point, the future osculum, at which no gastral cells lie and where the covering of dermal cells ruptures.

NEW MAMMALS FROM VICTORIA.

THE discovery of new mammals is so rare an occurrence that we hasten to record *Dasyuroides byrnei*, n.g. et sp., and *Sminthopsis larapinta*, n.sp., two marsupials discovered by the Horn Expedition in Central Australia, and described by Professor Baldwin Spencer in the *Proceedings of the Royal Society of Victoria*, vol. viii., pp. 5–13, as well as further described and figured in the account of the Horn Expedition. *Dasyuroides* is a burrowing, insectivorous marsupial of nocturnal habits, which in the general form of the body closely

resembles a large *Phascologale*, or a small *Dasyurus*, while its dentition is also like that of those species of *Phascologale* which approach *Dasyurus*. The skull, on the other hand, agrees with that of *Sminthopsis* in the character of the nasal bones, while the hindfoot in shape and in the absence of a hallux differs from that of both *Phascologale* and *Sminthopsis*. The specimens on which the description is based consist of six males and one female, and the dimensions of an adult male in alcohol are :—head and body, 182 mm.; tail, 130 mm.; ear, 18 mm.; hindfoot, 38 mm. The new *Sminthopsis* is a small mouse-like form, separated from the two known species, *S. murina* and *S. crassicaudata*, by a long, very stout, and highly incrassated tail, and by the greater relative length of the hindfoot.

A Placental Marsupial.

The absence of a true allantoic placenta has for long been regarded as a chief diagnostic character of the marsupials, distinguishing them, as well as monotremes, birds, and reptiles, from higher Mammalia. A recent discovery of J. P. Hill, demonstrator of biology in the University of Sydney, seems to destroy this generalisation. As yet we have seen only a preliminary note (*Proceedings* of the Linnæan Society of New South Wales, vol. x, p. 578), but the description and figure seem to make it plain that in the short-nosed bandicoot, *Perameles obesula*, an allantoic placenta occurs. The allantois is well developed, large, and provided with an abundant blood-supply. It consists of a long and somewhat flattened stalk and a terminal, expanded, and much flattened vesicular portion. The mesoderm of the outer surface of the allantois is fused with the mesoderm of the serous membrane. The capillaries of the vesicular portion, containing the fœtal blood, become closely applied to the surface of the uterine mucosa, and form with it a closely interlocking system, since they dip down into the substance of the mucosa to form short villous processes. The uterine mucosa is very richly supplied with blood, the maternal capillaries forming a net-work on and near the surface of the mucosa, so that the fœtal and maternal blood are thus brought into very close relation. The allantois of *Perameles* is thus functional both as a respiratory organ and as an organ of nutrition. Although this is truly an allantoic placenta, the differences between it and the placenta of higher mammals are sufficiently plain. It is not necessary to suppose that this marsupial placenta augurs a clear zoological affinity between the Peramelidæ and the Eutheria. But, no doubt, Mr. Hill will discuss these problems when the complete account of his investigations appears.

The Plesiosauria.

Mr. C. W. Andrews has been issuing useful additions to our knowledge of the structure of the Plesiosauria, but in no instance

have his unique opportunities been better turned to advantage than in the description of the Plesiosaurian skull. His account of this structure appears in the *Quarterly Journal* of the Geological Society for May, and is based on a specimen from the Lias of Lyme Regis, so perfectly preserved as to be comparable to a specimen taken from a recent animal.

The net result of his observations leads him to believe that "among reptiles a certain similarity of palatal structure does not necessarily imply any close relationship, but the very great resemblances existing between the Plesiosaurian and Rhynchocephalian palates, reinforced by the numerous points of likeness in other portions of their skeletons, pointed out by Baur, lead to the conclusion that the Sauropterygia, notwithstanding their single temporal arcade and thecodont dentition, are descended from a primitive Rhynchocephalian reptile." In this opinion Andrews is in complete harmony with Baur, Boulenger, Howes, Lydekker, and other writers.

AUSTRALIAN PICTOGRAPHS.

WE are glad to see that Australian scientific men are beginning to record the artistic efforts of the vanishing 'black-fellow.' The latest contribution to this interesting subject is a communication to the Royal Society of Queensland (*Proc.*, vol. xi., pt. 2), by Mr. R. L. Jack, the well-known Government Geologist. The Royal Society of Queensland evidently does not take its anthropology very seriously, judging from Mr. Jack's mistaken efforts to be humorous—or does he think this is popularising science? We hope that the figures have been in the first place carefully copied from the originals, and in the second place accurately reproduced. We have some doubts on the subject, as we find that the man in fig. 6 is described as having ten locks, but eleven are drawn; and, similarly, those in fig. 10 are drawn with eight locks instead of seven, as stated in the text, and their three hands are drawn with four fingers each, though one is credited with five fingers. This may seem trivial criticism, but, as a matter of fact, it is not so. The most absolute accuracy is requisite in transcribing native drawings and patterns, otherwise they lose almost all their value. A published drawing is of great value to the student at home as a document, but its accuracy should be above suspicion.

OWENS COLLEGE BIOLOGICAL STUDIES.

WE received some time since, from the authorities of the Owens College, Manchester, vol. iii. of *Studies from the Biological Laboratory*. This, like former volumes, consists of reprints from other publications of biological treatises written by those connected with Owens College, and it forms a convenient method of displaying the activity of the biological department of that institution. The present volume

opens with the presidential address delivered to the Biological Section of the British Association in 1890. It is a discussion of the general questions connected with development, in the most interesting style of the late Milnes Marshall. The second paper, reprinted from the *Proceedings* of the Zoological Society of London, contains the results obtained by O. H. Latter when, as Berkeley Fellow, he investigated the development of *Anodon* and *Unio*. The volume also contains the careful studies of marine Turbellaria made by F. W. Gamble, and contributed to the *Quarterly Journal of Microscopical Science*, Dr. Hurst's papers on *Archæopteryx*, which appeared in our own pages, and a number of other reprints by various authors.

Cambrian Fossils in Victoria.

In our February number we alluded to the discovery of the Cambrian trilobite, *Olenellus*, on the boundary between South Australia and Queensland in the far north. Cambrian rocks, as evidenced by fossils, were previously known in the Yorke Peninsula, in other localities within 300 miles of Adelaide, in Tasmania, and also from the Kimberley district of West Australia, although the exact locality of this latter appears to be rather doubtful. The occurrence of rocks of this age in Victoria has hitherto been assumed upon purely stratigraphical grounds. No remains, at all events of such a nature as to prove their age, had been found contained in them. But now, in the *Proceedings of the Royal Society of Victoria* (vol. viii. pp. 52–64, April, 1896), Mr. R. Etheridge, jun., describes a new genus and species of trilobite, which has been obtained from a limited outcrop of shale in the Heathcote district, Victoria, where Cambrian rocks had previously been supposed to exist. The fossils were found in 1894, and the time that has elapsed before publication is due to the care that Mr. Etheridge has obviously taken in determining their identity. The specimens, which consist of cephalic shields and pygidia, are all so decorticated, that their study is somewhat difficult. Mr. C. D. Walcott, to whom drawings were sent, identified one as a fragment of *Olenoides quadriceps* (Hall and Whitfield) a Middle Cambrian species, and said "The fossils undoubtedly belong to the Middle Cambrian Fauna, as they are not of the type found in the Upper or Lower Cambrian." Mr. Etheridge, however, after a careful examination, regards the fossils as representing a distinct genus and species, which he names *Dinesus ida*, in allusion to the two supplementary circumscribed lobes of the glabella, and to Mount Ida, near which the fossils were found. The little brachiopod which occurs with the trilobite is doubtfully referred to *Lakhmina*, a genus of the Trimerellidæ, which has been found in the Cambrian series of the Salt Range in India. Whatever may be the precise zoological position of the fossils recorded, there seems little doubt that they prove the existence of a Cambrian fauna in Victoria.

LINCOLNSHIRE GEOLOGY.

AMONG the lists of "new occurrences" and the contributions to parochial "floras," which crowd the pages of our provincial natural history magazines, it is refreshing to come across such a paper as that by Mr. J. H. Cooke in the *Naturalist* for July. Mr. Cooke, who is favourably known for the work that he has carried out during his residence in Malta, has returned to his native country to become the honorary secretary of the Geological Section of the Lincolnshire Naturalists' Union; and the paper that has attracted our attention is some wholesome advice and valuable suggestions given by him to the members of that Section, indicating how they may "utilise their energies to the best advantage by gathering material for the working out of some of the problems in the geology of the county." Among the problems to which attention is drawn is the demarcation of the line between the Kimmeridge and Oxford Clays, and also of that between the Kellaways Rock and the Cornbrash. "The Spilsby sandstone and the determination of its derived fossils, as well as the tracing out of sections showing the nodule bed which invariably occurs at its base, leave much to be desired. Good work, too, might be done around Gainsborough in distinguishing between, and mapping out, the estuarine and the eolian sands that occur so plentifully in the alluvium of the Trent Valley; and in the north of the country in studying the lithology and fossil contents of the superficial clays of the Ancholme Valley, for the purpose of determining whether they be true Oxfordian or of Glacial origin." The determination and correlation of horizons by careful collection of fossils, especially in the Liassic and Kimmeridge clays, is another desideratum. The various river deposits of Lincolnshire also are practically virgin ground, and like the gravels of the Bain and the Witham will probably yield remains of extinct Mammalia. Mr. Cooke then turns to the investigation of the various rocks of the country, such as the phosphate- and iron-bearing beds. He recommends their careful investigation by the chemist and the microscopist, confident that this, besides throwing light on the question of their origin, will lead to valuable commercial results. Finally he urges the systematic study of the erratic blocks of Lincolnshire, upon lines similar to those on which it has been carried on in the neighbouring shire of York. This stimulating paper is doubtless a sample of papers that might be written for every county in England, and shows that there is still plenty of work for the amateur geologist within the limits of his own parish. But Mr. Cooke wisely warns his readers against confining their ambition to the mere collection of records. "They should make themselves *en rapport* with the philosophy of their subject, and endeavour to keep themselves in touch with all new discoveries and theories appertaining to it."

Fossil Monocotyledons.

To the most recent issue of the *Annals of Botany* (vol. x., p. 205) A. C. Seward supplies some notes on the geological history of monocotyledons. The evolution of angiosperms and the relative position in the genealogical tree of the two subdivisions, monocotyledons and dicotyledons, afford problems of the highest interest, but to be approached only with extreme caution and a resolve to take into account every available piece of information. One important point, namely, the first appearance in time of the group in question, is the subject of Mr. Seward's remarks. "It is often assumed," he says, "that monocotyledonous plants are older than dicotyledons, and this assumption would seem to be supported by the facts of geological history." We remember a paper by Mr. Henslow, published in the Linnean Society's *Journal*, and somewhat severely criticised in Natural Science (vol. iii., p. 130), in which a reverse order was asserted, to wit, the origin of monocotyledons from dicotyledons, as the result of taking on an aquatic habit. The evidence, however, seemed anything but conclusive; but, on the other hand, Mr. Seward is forced to admit, with regard to palæontological data, "that no undoubted and satisfactory monocotyledonous plant has so far been recorded from strata older than those in which typical dicotyledons first occur." As the author points out, there are numerous difficulties and sources of error in the determination of fossil monocotyledons. We depend very largely for our knowledge on more or less imperfect casts or impressions of structureless stems and leaves, and it is conceivable that if the leaf-stalks of certain ferns and cycads were only partially preserved they might be regarded as monocotyledonous. Parallel venation is a very unsafe guide, and far too extensively followed. Many narrow leaves, phyllodes, or phylloclades of dicotyledons, would probably, if found detached in a fossil state, be referred to the other group.

The author then proceeds to review, critically and individually, the palæozoic and mesozoic 'monocotyledons.' Many are obviously too fragmentary for any satisfactory conclusion. It is often difficult to decide whether we are dealing with casts of animal or plant structure, as in the case of *Aviodes*, which has been considered by some as part of an aroid spadix, by others as a portion of the anal sac of a crinoid. The egg-capsule of a fish is the more generally accepted alternative in another case. Other genera are referred to calamites, mosses and conifers, and the conclusion of the whole matter is that the evidence at present available affords no proof of the existence of monocotyledons in Pre-Cretaceous strata.

Cypresses.

Dr. Masters has made another valuable contribution to the literature of conifers. The most recent issue of the Linnean Society's

Journal (vol. xxxi., pp. 312–363) comprises his monograph, or, as he prefers to style it, "general view" of the genus *Cupressus*. Cypresses are distinguished from their near allies the Thujas, which have similar foliage, by the shape of the cone-scales, those of the former having a shield-shaped expansion at the free end, which is absent in the latter. In *Cupressus*, also, each scale bears two or more seeds; in *Thuja* some scales only are fertile.

There are fourteen species, which, however, are so variable that it is hard to find distinctive characters which shall be generally applicable. A further difficulty arises from the polymorphy of the individual, the plant assuming different appearances at different periods of its growth. These stages of growth are usually transitory, but occasionally become more or less persistent, and when the whole or greater part of the plant is concerned, may produce an appearance quite different from the usual one. The "genus" *Retinospora* was founded on such plants, now known to belong to species of Cypress, Juniper, and Thuja. The identity is proved by the existence of intermediate forms on the same tree, by the presence of cones characteristic of the species, and by the fact that the leaf-characters of "*Retinospora*" are also true of the seedling plant, which only gradually assumes the adult foliage.

An interesting physiological difference exists between the various kinds of foliage. Cuttings bearing the primordial leaves strike freely, while those bearing the adult form take root less readily, "as if the vegetative energy were more or less arrested in anticipation of the commencement of the reproductive stage." Occasionally, however, flowers are borne on shoots bearing primordial leaves, as in a form of *Cupressus pisifera*, one of the Retinosporas.

Another feature, one of important horticultural value, is the tendency to "fastigiation," or an upward growth of the branches at an acute angle, such as occurs also in the Irish Yew.

Cypresses are found in a native state from South-eastern Europe, through the Levant and Persia, to the Himalayas, and in China and Japan. In the New World, there are two species in North-west America, several in California and the mountains of Mexico, and Guatemala; while on the eastern side of the Northern Continent *C. thyoides* extends from north to south.

DIATOMS.

THERE is evidently some work to be done on these microscopic algæ. At the Linnean Society's meeting on June 18th, Mr. G. Murray showed a series of lantern-slides, illustrating some very important observations on their reproduction. Professor Cleve has already figured in a Swedish journal a specimen of *Biddulphia aurita*, showing a young individual within the mother-cell. In the same genus Mr. Murray has also observed a still earlier stage, showing the contraction and

rounding off of the contents of the mother-cell. In a species of *Coscinodiscus* he saw a valve with a new diatom within it, and one with a pair of new diatoms, also the same species with cell-contents rounded off into eight and sixteen portions, and further free packets of eight and of sixteen young diatoms, held together by a fine membrane, as they had doubtless escaped from a parent-cell. Cases like the earlier recorded one of *Biddulphia*, where one new individual is produced, appear to be merely a rejuvenescence of the mother-cell. Mr. Murray's observations of preliminary divisions of the contents into eight and sixteen are of far greater interest, suggesting a reproduction by free-cell formation, a process hitherto unrecorded in the family. These discoveries show what a rich area of investigation is open to those who have the opportunity of examining the surface flora of the sea a few miles from the coast. The observations in the present instance were made while on a cruise round the northern coast of our island on behalf of the Fishery Board for Scotland.

Studies on Indian Garnets.

In a paper on "the Acicular inclusions in Indian Garnets" (*Records Geol. Surv. India*, vol. xxix, p. 16), Mr. T. H. Holland investigates the hair-like bodies in garnets from southern India, and contests Lacroix's conclusion that they consist of rutile. He regards them as an excellent example of schillerisation, and therefore as of secondary origin. The isotropic character of the garnet in which they lie enables their optical properties to be fully studied. Mr. Holland determines that the crystals are monoclinic, with their principal axes parallel to the edge of the octahedron of the including garnet, their orthopinacoids parallel to the face of the rhombic dodecahedron, and their clinopinacoids parallel to that of the cube. It seems possible that the so-called "faces" of the needles, could they be actually seen and not inferred, would be found to be merely superinduced by the mode of solution of the garnet, the material filling up the negative crystal having become continuously crystalline in each case and giving the optical properties recorded. But the constancy of Mr. Holland's results probably gives him good reason for regarding the long axes of the hairs as true crystallographic axes. The blue quartz, moonstone, and hypersthene, in the same rocks are also schillerised, a fact which strongly supports the author's contention that the asterism of the garnets is similarly due to secondary action.

In another interesting paper, "On the Origin and Growth of Garnets and of their Micropegmatitic Intergrowths in Pyroxenic Rocks" (*op. cit.*, p. 20), Mr. Holland touches wider ground, and leads us to reconsider our position with regard to the structure of some well-known rocks. All over the world there are masses of granular structure, remarkably similar in their general characters, and containing plagioclastic felspar, rhombic and sometimes monoclinic pyroxene,

garnet, magnetite, and perhaps quartz. The garnet often streams out in rays from a centre, forming micropegmatitic intergrowths with other minerals, after the manner of the spherulitic groupings in many eurites or fine-grained granites.

In the diorites of Chota Nagpore and the Sonthal Pergunnahs in Bengal, and in a series of masses from the hills of the Madras Presidency, ranging from granites to peridotites, Mr. Holland has studied the development of garnets by interaction among the original constituents. Where the garnet lies against pyroxene, or against the hornblende which is paramorphically derived from pyroxene, a reaction-border is visible in microscopic sections; moreover, the garnet bulges out towards the adjacent pyroxene, filling curved recesses in the latter, as if it had arisen at the expense of its neighbour. The stages seem to be as follows: the pyroxene becomes schillerised; then follows the formation of a zone of hornblende, which passes into a reaction-border, resembling the mingled materials known as "kelyphite"; and finally, according to the author, true garnet appears. The field-relations of the more pyroxenic and the more garnetiferous masses support the view that the latter are metamorphosed varieties of the former, the granular ("granulitic") structure having arisen from dynamic changes. Mr. Holland observes a fact commonly noticeable in our European "pyroxene-granulites"—the colour of the garnet and the pink tint of the pleochroism of the hypersthene are closely similar in the same rock-section; and he urges that this is due to a significant similarity in chemical composition. Anon he grows bolder, and regards the micropegmatitic intergrowths of felspar and garnet as of secondary origin, the felspar itself being "a by-product in the decomposition of the pyroxene."

We fancy that Mr. Holland accepts too unhesitatingly the theory of the secondary origin of the similar intergrowths of quartz and felspar, such as are common in the so-called "granophyres" of Rosenbusch. Nor is the analogy a safe one, for surely micropegmatitic structure must be regarded as primary in a still wider range of igneous rocks, equally with the pegmatitic structure of so many igneous veins. The value of the present paper lies in its attempt to connect the phenomena of a large series of rocks; and the force of its arguments will at any rate compel us to study again, especially in their field relations, the "pyroxene granulites" of more familiar areas.

THE SIGHT OF CHILDREN.

MR. BRUDENELL CARTER has recently presented to "My Lords" of the Committee of the Council for Education a valuable report upon the vision of elementary school children in London. Children to the number of 8,125, in twenty-five schools, were first submitted by their teachers, according to his directions, to the simpler test of vision.

This preliminary test showed that only about forty per cent. were possessed of what is regarded as normal vision. Of the remaining 4,900 odd, between two and three thousand were examined by Mr. Carter or by Mr. Belcher Hickman, who assisted him in the investigation. The examination of the whole number was impossible for many reasons, of which the chief was that their professional occupations made it impossible for the two gentlemen to conduct their investigations except in the afternoons. Moreover, a considerable number of parents objected, and holidays and the termination of school career interfered with the examination of many cases. It is believed, however, that quite a sufficiently large number of cases was studied to lead to valuable conclusions.

One of the most striking results is that there appears to be no special reason for attributing any increase in short sight to the influence of school-work and school accommodation. Many of the worst cases occurred in particularly well-lighted schools, and among children who were so young that the influence of school life could have had little time to operate. Moreover, recent optical work has made it possible to distinguish between simple myopia, which is more than likely to be an inherited structural peculiarity, and the progressive myopia which results from undue straining of the eyes. Cases of the latter kind were very rare, and bore no relation whatever to school life and school accommodation. This report will be a source of considerable comfort to many anxious school managers.

Process-Engraving in Colours.

In our note on the new photography and natural science (vol. viii., p. 375), we threw out a suggestion as to the application of photography in colours to the production of half-tone blocks for printing purposes. A greater advance than we even dreamt of has, however, it appears from the *Photogram*, been made by Mr. James W. McDonough, of Chicago. His discoveries consist, first, of photographing colours, and, secondly, of the application to purposes of printing. The photographic process is a simple adaptation of ordinary photography. A glass screen, ruled with lines from 300 to 600 to the inch, like that employed in the usual manufacture of half-tone blocks, has its lines coloured with aniline dyes, red, green and blue successively, the colour being everywhere of the same thickness. This is placed in the camera, immediately in front of an orthochromatic dry plate, on which a black and white negative is obtained with lines corresponding to the screen. From this negative the positive is made in the ordinary manner on glass or paper. If the transparent positive be placed in front of a screen like that used in the camera, so that the lines exactly register, the photogram will appear in natural colours; or if the paper on which the print is made be ruled exactly like the screen with red, green, and blue lines, which it may be men-

tioned are so minute and so close together that the paper looks white, then if the negative be placed over the paper so that the lines register, the print, which is made in the usual way, appears as a photogram in natural colours. Now for the application to printing. If an ordinary half-tone block be made from the negative, then impressions from this, printed in ordinary printing ink, on paper similarly ruled with coloured lines, will produce a result similar to that of the photogram in natural colours. If this account does not exaggerate the perfection of the work, it is clear that before long we shall be able to reproduce coloured illustrations in our scientific books of far higher quality than any that have hitherto been attempted, and at a cost but slightly exceeding that of the ordinary half-tone process print. At present, however, it seems to us that both photograms and process prints must be very dull in colour, since by the very conditions of the process, white itself must be two-thirds on the way to black. Moreover, since in printing the photograms it is absolutely necessary for the lines to register to within one-six-hundredth of an inch, we do not see how the difficulties produced by slight contractions and expansions of film and paper can be got over.

AMERICAN ENTOMOLOGY.

WE have received the third and fourth bulletins of the technical entomological series issued by the U.S. Department of Agriculture. The former is a revision by Mr. C. L. Marlatt of the North American sawflies of the sub-family Nematinæ. In his classification of the group Mr. Marlatt follows Fr. Konow, the old genus *Nematus* being split up into several genera. Many new forms are fully described and several figured. These insects are most numerous in the Boreal and Transition zones of North America, decreasing in the South. A similar distribution is to be noted on our side of the Atlantic, for while Sweden possesses 95 species and Scotland 70, Southern Italy has only 12. The fourth bulletin comprises short papers by various authors on injurious insects likely to be introduced into the United States from Mexico and Japan. It appears that the entomologists are watching the frontiers prepared to wage war on invaders.

I.

Joseph Prestwich.[1]

AMONG the more distinguished of the second generation of British geologists—a band comprising such men as Godwin-Austen, Falconer, Morris, Edward Forbes, Egerton, Jukes, Ramsay, and Daniel Sharpe—the subject of our present memoir has long outlived each one of them, and the close of his life, at the advanced age of 84, severs the most prominent link which connected the geologists of the present day with the Old Masters.

Joseph Prestwich was born at Pensbury, Clapham, on March 12, 1812, and was descended from an old Lancashire family. One of his ancestors, Sir Joseph Prestwich, Bart., was an active Fellow of the Society of Antiquaries, and a manuscript written by him about the year 1798, dealing with the subject of earthquakes, was published by Joseph Prestwich in the *Geological Magazine* for 1870. At one time Prestwich entertained the idea of claiming the baronetcy, which his father had declined to take up, but owing to the loss of documents this intention was abandoned.

Receiving his early education partly in London, partly in Paris at a school attached to the College Bourbon, and partly under the famous Dr. Valpy at Reading, Joseph Prestwich completed his studies at University College, London. There he learnt chemistry under Dr. Turner, and natural philosophy under Dr. Lardner; and he gained some acquaintance with mineralogy and geology from a few lectures included in his course by the Professor of Chemistry. That he had a leaning towards experimental science was evident, for he subsequently formed a laboratory, which he maintained until about the year 1860. His own tastes would have prompted him to adopt a profession, but circumstances caused him to enter his father's business of wine merchant, and in this he was closely occupied for about forty years until 1872, when he retired from his office in Mark Lane.

The brief introduction to geological science which Dr. Turner had given, was destined to bear the most excellent fruit. Prestwich was thus led to examine the collections of fossils in the British

[1] For some particulars relating to Sir J. Prestwich we are indebted to an article printed in the *Biograph* for December, 1881, and reprinted with additions and revisions in the *Geological Magazine* for June, 1893.

Museum; and the works of Conybeare and Phillips, of De la Beche, and Lyell, became his text-books.

Entering the field of geology, as he tells us, for relaxation from the cares of commercial life, he had in his early years only such time as could be snatched from business at intervals, and chiefly on Saturdays and Sundays. Fortunately his duties led him into various parts of the country, and every opportunity was taken of making acquaintance with the physical features and structure of the districts he visited. It is, however, wonderful to find how much he achieved, how early he had mastered the principles of geology, and how sound were his interpretations of facts.

His holidays during the years 1831 to 1833 were for the most part spent in the region of Coalbrook Dale, and the results of his researches were communicated to the Geological Society of London in 1834 and 1836. This work was published in full in the *Transactions* of the Society, and looking at it now it may be regarded as a model of what a memoir should be on such a subject as the coal-field and its associated strata. The Silurian and Carboniferous rocks, the New Red Sandstone, the igneous rocks and the drifts were all duly described, and what is more remarkable, considering the youth of the author, the superficial extent of the various rocks was shown on a map of the scale of one inch to a mile, in a manner differing in no very important particulars from the subsequently published map of the Geological Survey. The structure of the area and its faults were carefully depicted, while the organic remains which Prestwich had obtained were described with the aid of his friend John Morris. So highly indeed would we speak of this work, that had the author done nothing subsequently, we believe it would have entitled him to a permanent place on the roll of those geologists who have rendered distinguished service.

In 1835 another paper was read by Prestwich before the Geological Society, on the ichthyolites of Gamrie in Banffshire, and this was his first published work. In 1837 he supplemented it with observations on the drift deposits, including those of Blackpots, and he noted the existence of a raised beach.

These early studies give a good idea of the bent of his mind, his attention being given to stratigraphical geology and to the physical conditions under which strata were accumulated. In later years he turned again to the Coal-measures in other regions, especially in Somerset, and to their possible underground range in the south-eastern counties, while the subjects of drifts and raised beaches gained eventually more and more of his attention.

Prestwich was elected a Fellow of the Geological Society in 1833, when Greenough was president; and he first became a Member of Council in 1846, when Murchison was president and Sedgwick, Buckland, Fitton, Lyell, De la Beche, and others were his associates.

He had now for some years been particularly occupied in what

may be considered his chief work—the elucidation of the Eocene strata of the London and Hampshire basins.

Commencing in the London area he zealously traversed the country wherever the Lower Tertiary strata were to be found, and hardly an outlier of any importance escaped his observation. Mr. Whitaker, who more than any other man has followed in the footsteps of Prestwich over this large region, referred in 1872 to the literature of the subject, and remarked that the period 1841 to 1860 "might well be called the 'Prestwichian period,' from the author who first clearly made out the *detailed* structure of the London basin."[1]

After certain preliminary studies, the interest and difficulties of the subject, as Prestwich himself relates, speedily induced him to take it up with more earnestness and determination, and eventually led him to extend his enquiries over an area which at first he never contemplated. With true enthusiasm he remarked "The Tertiary geology of the neighbourhood of London may be wanting in beauty of stratigraphical exhibition and in perfect preservation of organic types, but in many of the higher questions of pure geology—in clear evidence of remarkable physical changes—in curious and diversified palæontological data, however defaced the inscriptions, which is after all but a secondary point, few departments of geology offer, I think, greater attractions." These statements were made in 1849 when De la Beche handed to him the Wollaston Medal, which had been awarded by the Council of the Geological Society. He had then completed but a portion of those labours which established his reputation as the leading authority on our Tertiary strata. Having already extended his researches from the London to the Hampshire basin, he subsequently followed the strata into Belgium and France, correlating the divisions he had made in this country with those established abroad by Dumont and D'Archiac.

His great aim was, by studying in detail the lithological characters of the strata and their fossils, to mark out the main subdivisions in the Eocene system, and to picture the ancient physical conditions which attended their formation. By following the strata from point to point he was enabled to record the mineral changes which many of the subdivisions undergo, and to note the changes in fauna that accompany these variations in sedimentary condition. He also showed how differences in the flora in certain formations pointed to distinct land-areas. Thus were fossils employed, as they should be in geological investigations, in interpreting the physical conditions of the strata after the stratigraphical features had been determined, and in aiding the subsequent correlation with distant deposits.

In his earlier papers on Eocene formations he dealt with the age and relations of the London Clay and Bagshot Beds. He proved the connection of the London Clay and Bognor Beds, and showed that they

[1] *Mem. Geol. Survey*, vol. iv., p. 395.

were older than the clays and sands of Bracklesham and the clays of Barton. He subdivided the Bagshot Beds, and correlated with them certain strata in Hampshire and the Isle of Wight. Subsequent researches by Mr. Starkie Gardner, Mr. Monckton, and Mr. Herries, have thrown doubt on the correlation of the Upper Bagshot Sands of Surrey with those of Hampshire (the Headon Hill Sands); and in a later work[1] Prestwich agreed that the Upper Bagshot Sands of the London area might be partly or wholly of Bracklesham age. Ready at all times to accept corrections when assured of their accuracy, he was also not unwilling to admit changes in classification when the alteration was for the general convenience. Thus he adopted the term Oligocene for strata previously grouped as Upper Eocene. He did not, however, agree with Mr. Whitaker in his proposal to form a separate division, termed the Oldhaven Beds, from strata in part grouped by Prestwich with the basement-bed of the London Clay, and in part with the Woolwich and Reading Series.

Continuing his researches Prestwich described in full detail the strata between the London Clay and Chalk, giving the names "Thanet Sands" and "Woolwich and Reading Series" to strata previously grouped together as the "Plastic Clay Formation." Referring to the important series of Eocene memoirs, which he had completed in 1854, Edward Forbes remarked, "These remarkable essays embody the results of many years' careful observation, and are unexcelled for completeness, minuteness of detail, and excellence of generalisation."[2]

A popular account of the Eocene strata and of the superficial deposits that occur in the neighbourhood of London was given by Prestwich in 1854 and 1856, in the course of three lectures on the geology of Clapham, and these were published a year later under the title of "The Ground Beneath Us." Clearly and pleasantly written, this little work was well calculated to arouse the interest of the reader, and at the time of its publication it was one of the best introductions to geology which it was possible to place in the hands of a beginner.

While Prestwich gave his attention in the main to pure science, he did not neglect the important applications of knowledge. By his publication in 1851 of "A Geological Inquiry respecting the Water-bearing Strata of the country around London," he came to be recognised as the leading geological authority on the subject; and in 1867 he was appointed a Member of the Royal Commission on Metropolitan Water Supply.

He was elected a Fellow of the Royal Society in 1853, and Vice-President in 1870; in that year also he became President of the Geological Society. In his second address to that Society in 1872, he gave an excellent and oft-quoted account of the growth of London as dependent on the means of obtaining a supply of water. In the same address he referred to the many aspects of geological science, and remarked that, "While treating of these abstract and philo-

[1] "Geology," vol. ii., p. 364.

[2] Address to Geol. Soc., 1854.

sophical questions, geology deals also with the requirements of civilised man, showing him the best mode of providing for many of his wants, and guiding him in the search of much that is necessary for his welfare. The questions of water-supply, of building materials, of metalliferous veins, of iron- and coal-supply, and of surface-soils, all come under this head, and constitute a scarcely less-important, although a more special, branch of our science than the palæontological questions connected with the life of past periods, or than the great theoretical problems relating to physical and cosmical phenomena."

He reverted to the subject of water-supply soon after he came to reside in Oxford, publishing a pamphlet on the geological conditions affecting water-supply to houses and towns, with especial reference to that city. He dealt in 1874 with the subject of the proposed tunnel between England and France, and his essay, published by the Institution of Civil Engineers, gained for him the Telford Medal.

At an earlier period he superintended the enquiries concerning the Bristol and Somerset coal-field for the Royal Coal Commission, and prepared reports (published in 1871) on that area, and on the probability of finding coal under the newer formations of the south of England. With regard to the latter subject he took a favourable view, and observed that we might look for coal-basins "along a line passing from Radstock, through the vale of Pewsey, and thence along the North Downs to Folkestone." The results of the Dover boring have, so far, justified this conclusion, which was based on the acute geological reasonings of Godwin-Austen. At various periods, moreover, he described important well-sections at Yarmouth, Harwich, Kentish Town, and Meux's Brewery in London.

The completion of his labours among the Eocene strata allowed Prestwich to devote more time to the newer deposits, which had on various occasions engaged his attention.

He had examined the Norwich Crag as early as 1834, in company with S. Woodward, and he then found a tooth of *Elephas meridionalis* in the Thorpe pit. Accompanied by Godwin-Austen, Morris, and Alfred Tylor, he had, in 1849, made a short excursion into the crag district, and he then suggested that the fossiliferous shell-bed which overlies the Red Crag, at Chillesford, might represent the Norwich Crag. He returned, in 1858, to the subject of the crag in his description of the remnants of that deposit which occur at Lenham and other places on the Chalk areas of the North Downs. Although the species of fossils were but doubtfully identified by Searles Wood, and some authorities came to regard them as probably Eocene, yet Prestwich contended for their Pliocene age, and his views have been fully confirmed by the subsequent observations of Mr. Clement Reid.

In 1868, he communicated to the Geological Society the first part of his elaborate work "On the Structure of the Crag-beds of Suffolk and Norfolk." The three parts were published in 1871.

They contained the results of his long labours, and as he remarks, "The greater part of my observations date, in fact, so far back as from 1845 to 1855."

In some respects this was unfortunate, since the author had been too much occupied to work out the results of his observations while they were quite fresh in his mind; moreover, he did not fully realise how much had been done by previous observers. In omitting to notice in detail work that had been previously published, he observed, "I may be further justified in this course by the circumstance that my own researches are in great part anterior to most of the papers in question"—a plea that fails to satisfy the worker who is keen on priority of publication. One noteworthy result of this was the introduction into Norfolk of the term "Westleton Beds," for strata previously described at certain localities by Wood and Harmer under the name of Bure Valley Beds. It has now been clearly shown that the Bure Valley Beds (of the Bure Valley) are of earlier age than the Westleton Beds (of Westleton), the former being linked with the Norwich Crag (Pliocene), and the latter being rightly regarded by Prestwich as Pleistocene. What may be the particular horizon in the Pleistocene group of the Westleton Beds is still a matter of dispute. No fossils have yet been found in the Westleton Beds at Westleton, and it is, therefore, a matter of great uncertainty as to how far correlation is justified with the other unfossiliferous pebbly gravels of the eastern and southern counties of England. Prestwich has, however, published a series of papers on these scattered deposits, and the facts which he has made known must always prove of value, while his theoretical conclusions, which have added largely to the interest taken in the subject of gravels, cannot fail to have beneficial results.

The importance of an attentive study of the Glacial Drift and other superficial deposits was pointed out by Joshua Trimmer, and he was followed by S. V. Wood, Junr., who, pursuing the subject in great detail, personally surveyed on the one-inch ordnance maps large areas of the eastern counties, and stimulated others like Mr. F. W. Harmer, in Norfolk, and the Rev. J. L. Rome, in Lincolnshire, to co-operate with him. Prestwich, meanwhile, had made particular observations here and there, and chiefly between the years 1855 and 1861, in Holderness, at Mundesley, Reculvers, Hackney, Salisbury, and Brighton. He devoted his attention more especially to fossiliferous deposits of valley drift and to raised beaches. He described a few sections of Glacial Drift, but did not yet enter into any general discussions with regard to the classification of our Pleistocene deposits.

His most important researches among the latter deposits were unquestionably those relating to the valley or river gravels, and to the occurrence in them of flint implements and certain fossil Mammalia.

The discoveries, made known in 1847 by Boucher de Perthes, of flint weapons together with teeth of the mammoth in the gravels of the Somme Valley had attracted the attention of Dr. Falconer, and he induced Prestwich, in 1859, to investigate these most interesting deposits. After careful study, in which he was joined by Sir John Evans, he satisfied himself that the flint implements were the work of man, that they occurred undisturbed in beds of sand and gravel, together with remains of mammoth, *Rhinoceros tichorhinus*, *Hyæna spelæa*, and other Pleistocene Mammalia.

These researches were in part stimulated by the discovery, in 1858, of flint implements with bones of extinct animals in Brixham Cave; and they served to confirm the previous and long-neglected discovery of flint implements in Kent's Hole, Torquay, made by the Rev. John MacEnery. Sir John Evans, moreover, directed attention to the forgotten discovery of flint implements at Hoxne, in Suffolk, a fact originally published in 1800. No time was, therefore, lost in visiting this and other English localities, and the results were brought before the Royal Society in 1859 and 1862. At the conclusion of his second paper, Prestwich remarks: "That we must greatly extend our present chronology with respect to the first existence of man appears inevitable; but that we should count by hundreds of thousands of years is, I am convinced, in the present state of the inquiry, unsafe and premature." In his latest observations on the subject, he has expressed his belief "that Palæolithic Man came down to within 10,000 to 12,000 years of our own time," while he may have had, "supposing him to be of early Glacial age, no greater antiquity than, perhaps, about from 38,000 to 47,000 years" (Collected Papers, p. 46).

For his original researches on the valley deposits yielding implements and weapons of palæolithic man, Prestwich was awarded a Royal Medal by the Royal Society, in 1865. The full report on the exploration of the Brixham Cave was prepared by Prestwich and communicated to the same Society in 1872, the animal remains being described by Busk, and the flint implements by Sir John Evans.

About the time of his retirement from business in 1872, Mr. Prestwich married the niece of his old friend Dr. Falconer, and settled in a house (Darent Hulme) which he built at Shoreham, near Sevenoaks. He was not, however, to retire from active geological work. After the death of John Phillips in 1874 he was offered the professorship of Geology at Oxford, and this he accepted, now spending a portion of his time in that city. The duties of a geological professor at Oxford are not perhaps very onerous, but Prestwich filled the office with dignity and advantage to the University. Phillips, who excelled in eloquence, had at times no more than three students, as geology received no encouragement from the University authorities. Few geologists of note have, therefore, hailed from Oxford as compared with Cambridge, and we call to mind only Edgeworth David (now Professor of Geology in the University of Sydney) and

F. A. Bather (of the Geological Department, British Museum), who, trained in geology under Prestwich, have since gained distinction. His field-excursions, however, were always highly appreciated by many who found no time to pursue the science in after-life.

Various papers proceeded now from his pen: he dealt with the much discussed origin of the parallel roads of Glen Roy, and he wrote on the agency of water in volcanic eruptions, believing that the water was but a secondary cause, and that the phenomena were dependent on the effect of secular refrigeration. He dealt also with the problem of the thickness of the earth's crust, and published an elaborate paper on underground temperatures.

He also made a special study of the Chesil Beach, coming to the conclusion that it was a wreck of an old and extensive raised beach, of which a remnant still exists on Portland. His view concerning the comparatively recent date of the Weymouth anticline has not, however, proved to be sound.

During his term of professorship, Prestwich wrote his well-known work entitled "Geology, Chemical, Physical, and Stratigraphical," in two volumes, published in 1886 and 1888, a work admirably illustrated. In the first volume he remarked that among geologists two schools have arisen, "one of which adopts uniformity of action in all time, while the other considers that the physical forces were more active and energetic in past geological periods than at present." Advocating this latter teaching, he felt he should be "supplying a want by placing before the student the views of a school which, until of late, has hardly had its exponent in English text-books." He indeed protested on many occasions against the doctrine of uniformity of action, both in kind and in degree. Such, indeed, was the teaching of Ramsay in his Presidential Address to the British Association at Swansea in 1880. That geologist referred to the great changes, of which we have evidence in comparatively late geological times, in the upheaval of mountain chains, and in the vicissitudes of the Glacial period; and, in regard to volcanoes, he believed that "at no period of geological history is there any sign of their having played a more important part than they do in the epoch in which we live." Ramsay based his argument on the record of the rocks, and, leaving out of consideration cosmical hypotheses, he concluded that, from the epoch of our oldest known rocks down to the present day, "all the physical events in the history of the earth have varied neither in kind nor in intensity from those of which we now have experience." This conclusion may be taken to mean that any kinds of physical change that have happened in the past since the earliest rocks were laid down may happen again, and we believe that this is the real view of the Uniformitarian. Mr. Teall, again, in 1893, forcibly urged the claims of the Uniformitarian school, pointing out "that denudation and deposition were taking place in pre-Cambrian times, under chemical and physical conditions very similar to, if not identical with, those of

the present day." All geologists seek to interpret the past by the light of the present, but while Uniformitarians (as they are called) demand time unlimited, their opponents, sometimes spoken of as Catastrophists, would rather infer a greater potency in the agents of upheaval or denudation than grant an unlimited amount of time.

As Prestwich puts it, "Not that time is in itself a difficulty, but a time-rate, assumed on very insufficient grounds, is used as a master-key, whether or not it fits, to unravel all difficulties. What if it were suggested that the brick-built Pyramid of Hawâra had been laid brick by brick by a single workman? Given time, this would not be beyond the bounds of possibility; but Nature, like the Pharaohs, had greater forces at her command to do the work better and more expeditiously than is admitted by Uniformitarians." (Collected Papers, 1895, p. 2). He maintained that modern estimates of denudation and deposition, and of rates of upheaval and depression, were no test of what happened in the past: that, in fact, the potency of agents had diminished. Referring to the Glacial period, in his inaugural lecture on "The Past and Future of Geology," delivered at Oxford, in 1875, he thus expresses himself: "This last great change in the long geological record is one of so exceptional a nature, that, as I have formerly elsewhere observed (*Phil. Trans.*, 1864, p. 305), it deeply impresses me with the belief of great purpose and all-wise design, in staying that progressive refrigeration and contraction on which the movements of the crust of the earth depend, and which has thus had imparted to it that rigidity and stability which now render it so fit and suitable for the habitation of civilised man; for, without that immobility, the slow and constantly recurring changes would, apart from the rarer and greater catastrophes, have rendered our rivers unnavigable, our harbours inaccessible, our edifices insecure, our springs ever-varying, and our climates ever-changing; and while some districts would have been gradually uplifted, other whole countries must have been gradually submerged; and against this inevitable destiny no human foresight could have prevailed."

His great text book on geology to which we have alluded, will remain as a monument of his zeal and untiring labour. On its completion he resigned his professorship, and retired to his quiet home among the Chalk hills of Kent. There, however, he maintained his interest in his favourite science, and continued to labour to the very end of his days. Soon after leaving Oxford, in 1888, he was called upon, as our leading geologist, to preside over the meeting of the International Geological Congress, which then held its fourth session in London.

The study of the drifts of the south and south-east of England now absorbed most of his time, and he devoted more attention o the grouping of the later superficial deposits and to the great physical changes to which they bear witness. His ideas on all these topics have not met with the unanimous approval of geologists, nor was such

a happy result to be expected on a complex subject where there is great room for diversity of opinion. His views on the primitive character of the flint implements of the Chalk plateau of Kent have, however, opened up a new and interesting enquiry, and one more likely perhaps to gain support than his evidences of a submergence of Western Europe at the close of the Glacial period, and their bearing on questions relating to the tradition of a flood.

It is, however, yet early to judge of these controverted questions. They require further detailed study and impartial consideration, and whatever conclusions be eventually accepted, there can be no doubt that the patient and enthusiastic labours of Prestwich on these most difficult problems will have largely contributed to their solution.

Throughout his long life, Prestwich felt deeply indebted to geology, and as he once put it, not merely because it was a source of healthful recreation, but "for its kindly and valued associations, and above all, for the high communing into which it constantly brings us in the contemplation of some of the most beautiful and wonderful works of the creation."

In the early part of the present year Her Majesty conferred the honour of knighthood upon him, but Sir Joseph Prestwich was too feeble in health to accept it in person. He died on June 23, and was buried in the churchyard of Shoreham, near Sevenoaks, not far from his pleasant home of Darent Hulme.

H. B. WOODWARD.

II.

On English Amber and Amber generally.[1]

I.

AMBER was known and prized as far back as the stone and bronze ages, and the men of those times, if they could not find it at home, brought it back from abroad. The amber trade is, therefore, one of the oldest of trades, and its history would form a very interesting chapter of the history of commerce.

What, however, is the meaning of "amber," and what qualities does it possess? I do not remember that this has been discussed as yet at any meeting of the British Association, and for that reason, here, in the amber country of England, I may be allowed to say something about English amber and amber generally, its character and occurrence, its mode of formation by the mother plants, and the vegetation of the amber period.

Amber is not the scientific name of a distinct fossil, but only a collective name of several different fossil resins and gums occurring in various parts of the world. Ambers are found dispersed over nearly the whole of Middle Europe, and occur also in Siberia and Saghalien, in Spain, Italy, and Roumania; further, in Burmah, Japan, North America, Greenland, Mexico, etc. Most of them differ amongst themselves as regards their origin and formation, their chemical and physical qualities, and also with respect to the organic remains found in their interior. On that account it is indispensable to introduce special names to distinguish the various kinds of amber, such as *Simetite* for the amber from Sicily, *Roumanite* for the amber from Roumania, *Burmite* for the amber from Burmah, and so on.

Amber is especially common in the Baltic district, that is, in the Baltic Sea and in all the countries surrounding it. But even this Baltic amber comprises several heterogeneous resins and gums, which have been thoroughly investigated and described. Only the following kinds need be mentioned here:—

1. **Gedanite,** a yellow transparent amber without appearances of polarisation or fluorescence. It looks as if it were covered with white powder, part of which can be wiped away, and this external feature is very characteristic of gedanite. The hardness is only

[1] An address delivered in Section K of the British Association for the Advancement of Science, Ipswich meeting, 1895.

1·5 to 2. Knocking and cutting easily splits it asunder, and therefore it is not of much value for working. Its fracture is conchoidal and glassy. By heating it to between 140°–180° C. it becomes inflated, and by heating more it begins to melt. The plant which produced gedanite is not known, but sometimes the amber encloses small fragments of a pine-like wood, possibly belonging to the trees which produced the resin. Small leaves also of other plants, which can be scarcely determined, and several kinds of insects are found in the interior of this fossil resin.

2. **Glessite** probably is a gum-resin of a vegetable hitherto unknown. It is of brown colour, almost opaque and also without polarisation or fluorescence. The degree of hardness is 2. The fracture is conchoidal and greasy. No remains of plants or animals are found in the interior.

3. **Succinite** is usually transparent or translucent, sometimes opaque, and it shows all gradations from clear to milky or quite opaque appearance. The yellow colour is the most common, but it is found in many other colours, such as green, red, white, or black. There is probably no tone of colour which might not be represented by specimens of succinite. The crust is dark-coloured and firmly adherent. The hardness is 2 to 3, greater, therefore, than that of all other kinds of Baltic amber. It is true it is somewhat brittle, but it can be worked very well; its fracture is conchoidal and greasy. Its specific gravity is 1·050 to 1·096, and, owing to its lightness, pieces are often driven ashore by waves of the sea. When burnt, succinite gives off an agreeable aromatic odour, though it irritates the mucous membrane of the mouth and nose. When heated, it melts at 250° or 300° C., without being inflated before; its melting-point is, therefore, higher than that of gedanite, which is very similar to succinite in other respects. The chief products obtained by its distillation are 3 to 8 per cent. succinic acid, a peculiar empyreumatic oil, carbonic acid, water, and hydrogen. The great amount of succinic acid is very characteristic of this kind of amber. The elementary analysis of succinite, according to O. Helm, is the following:—78·63 per cent. carbon, 10·48 per cent. hydrogen, 10·47 per cent. oxygen, and 0·42 sulphur. An investigation of its solubility gives the following results: 20 to 25 per cent. is soluble in alcohol, 20·6 per cent. in chloroform, 18 to 23 per cent. in ether.

In general, succinite is the most common and the best known of the Baltic ambers, and of all ambers of the world, wherefore it might be termed Baltic Amber *par excellence*. Together with gedanite and glessite, also with loose rounded bits of carbonised woods, and various remains of crustaceans, echinids, etc., it is found in a deposit of sand containing glauconite, and called Blue Earth, belonging to the Lower Oligocene formation of the Samland in Prussia. This is not the primitive position of these resins; they have been floated there by the waves in the beginning of the Tertiary period. However,

succinite is much more frequent in the diluvial deposits of Middle Europe, especially in North Germany, Poland, Holland, Denmark, and South Sweden; and washed out of these deposits, it is carried away and dropped down to the bottom of the sea or is carried ashore. Thus it is to be found on the south coast of Finland, on the islands of Ösel, Öland and Bornholm, as well as on the Dutch coast (Rottum, Schiermonnikoog, Scheveningen, etc.) and on the south-east coast of England. The physical and chemical qualities, and also the vegetable and animal enclosures, prove that the amber from the shores of the German Sea is, almost without exception, true succinite.

English amber in general has been well known for a long time, and lately the monographer of Norfolk geology, Mr. Clement Reid, has drawn the attention of scientific men to this fossil resin. I have more recently also become acquainted with it, and have had the opportunity of learning something more about it at Ipswich. The most southern locality I know for its occurrence is Walton-on-the-Naze, in Essex, and I have seen some small pieces from Walton in the mineralogical collection of the Natural History Branch of the British Museum. I have also seen a large number of specimens in the county of Suffolk, particularly from Felixstowe Beach, through the kindness of Miss Tiny Gower, Mrs. Charlotte L. Ransome, Mrs. Sims, and Mr. Henry Miller, of Ipswich. Mrs. Sims has about forty pieces, the largest of which weighs more than one kilogram. They show various gradations of colour, from light yellow to dark reddish brown, and a few look just like glessite, but their microscopical structure is different. Further, I am told that Mr. C. T. Townsend has had for the last thirty-five years a piece of amber found on the West Rocks, near Ipswich, which weighed more than 100 grams. I have also heard of the occurrence of amber at Orford Ness and Aldeburgh, in Suffolk. Mr. Robert I. Candon, at Southwold, states that for several years he has bought from local fishermen lumps of amber which have either been found on the shore or brought up in the fishing-nets.

In Norfolk, also, succinite is found. First, Mr. Clement Reid has described, in the *Transactions* of the Norfolk and Norwich Naturalists' Society (vol. iii., p. 602), a transparent and wine-coloured amber, from Yarmouth Beach, containing three flies. Mrs. Burwood, of Yarmouth, possesses many specimens, a good many of which were brought in by the fishermen and purchased from them. A note on this collection is published by Mr. Alfred S. Foord in the same *Transactions* (vol. v., p. 92). According to this account, most pieces are of a rich wine-yellow colour; however, there are several of a lemon-yellow, and a few quite opaque, looking like ivory. The locality of one of these latter is accurately known, for it was picked up on the beach at Winterton, about nine miles north of Yarmouth. It is true I have not seen all the specimens from Orford Ness, Aldeburgh, Southwold, Yarmouth, and Winterton, but I incline to think that

they belong also to the succinite class of ambers. I have also seen some pieces of real succinite from Happisburgh and Mundesley, in the collection of Mr. W. George Sandford, at Cromer.

The principal place where English succinite has been found is Cromer itself, though it certainly does not occur so often as one might expect from the pieces exhibited in the shops of the town; but Mrs. A. Fox, of Jetty Street, assures me that all specimens exhibited in her own window are collected along that coast, and I have seen there many small and large ones of various and beautiful tones. One or two pieces have the same brown, clouded, and glessite-like appearance as those of Mrs. Sims, of Ipswich, and it would be well to direct attention more to this variety, or even species, of amber for the future. Besides that, I have seen many pieces of succinite from Cromer and from Sherringham in the possession of Mr. Sandford and other gentlemen of Cromer. It is also represented in the British Museum (Natural History), and in some local collections of the country. By the kindness of Mr. Clement Reid, in London, and Mr. George Sandford, in Cromer, I obtained some yellow clouded specimens, which are exhibited now in the Natural History Museum of Danzig. On the other hand, much of the succinite in other shops of Cromer is imported from abroad in order to satisfy the demand of seaside visitors.

In all probability it is met with still further north, and indeed I am told by Mr. Reid that a good deal is found in Yorkshire. I do not know the localities and I never saw a specimen from there, for which reason I am not quite sure if this northern amber belongs to the succinite group.

It might also be mentioned that Mr. William Whitaker has described a piece of amber from the coast of Kent ("Geology of London," vol. i., p. 528, London, 1889), and he was kind enough to send me the piece picked up by him at Deal when a boy. From the examination of this specimen it appears that it is not real amber, but copal. The same author makes mention of the Highgate resin in the London Clay at Highgate, and at a few other London localities, particularly at Richmond (*l.c.*, pp. 258 and 528). It was discovered during the excavations for the Highgate Archway, where it occurred "in irregular pieces of a pale yellowish aud dirty brown colour, resembling the resin copal in colour, lustre, transparency, and hardness. It is also equally difficult to dissolve it in alcohol." Of course, this fossil is anything but succinite; it may rather be called a sort of retinite, as there are very many in the Tertiary formation of various countries. Amber is reported to occur near Dublin and in other parts of Ireland; however, the specimens I know from there are all copal.

On the other hand, in the mineralogical collection of the British Museum (Natural History) I met with a brownish-coloured translucent piece of amber, which was bought from Mr. B. M. Wright, in August, 1863. According to Mr. A. C. Seward's statement, this

fossil is said to occur rarely in the Cambridge Greensand, which belongs to the Cenomanian, and for this reason I am much indebted to the British Museum for having given me a small piece for examination. This has shown that the Cambridge amber is softer and more brittle than succinite, and that its chemical qualities are different. For the results of an analysis by Mr. O. Helm, at Danzig, show that 0.3 grms. of it produce, by dry distillation, only 0.006 grams of hydrated succinic acid, corresponding to 0.005 grams anhydrous succinic acid, which means 1.66 per cent. Thus the Cambridge Greensand amber differs from succinite not only in its geological age but also in its physical and chemical characters. To this fact I wish to draw the attention of English geologists and botanists, who would be able to obtain larger quantities of this amber, and who should specially notice any enclosures of vegetable and animal remains in it.

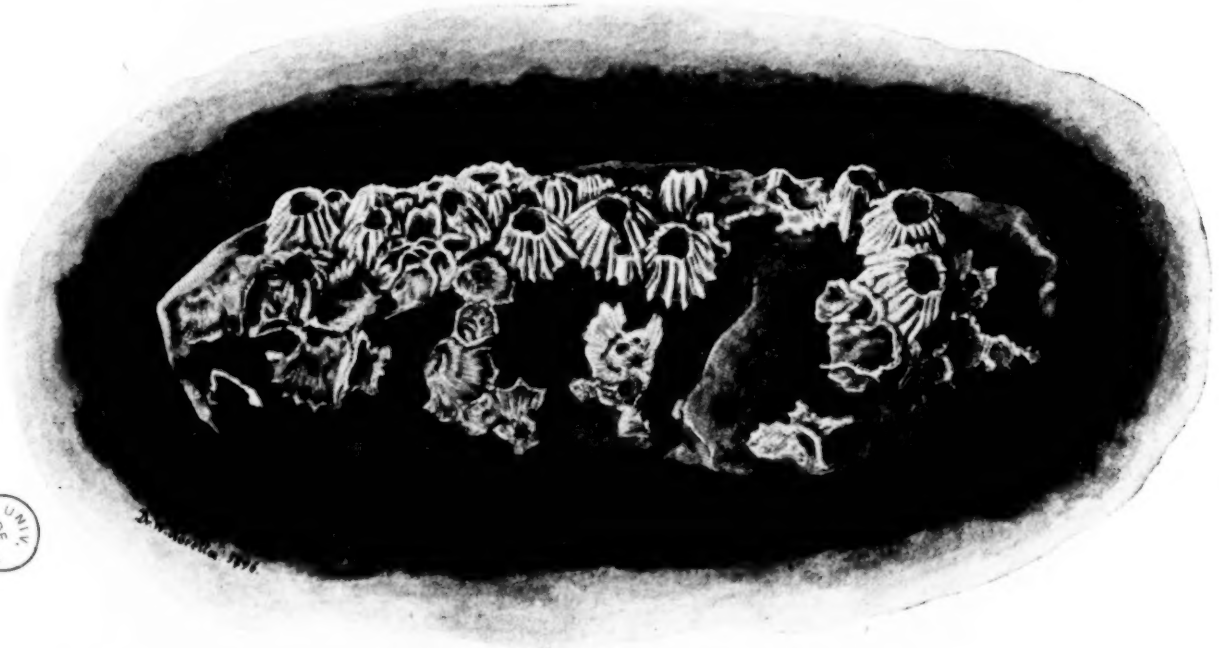
Succinite proper, then, has been found, in England, hitherto only on the east coast from Essex to Yorkshire. Probably that is the most western locality of succinite in general, though I certainly remember in the Zoological Department of the State Museum at Stockholm a pretty large piece of succinite, covered with bryozoa and tubicolous annelids, and perforated by *Pholas cuneiformis*, Say, which species only occurs on the south-east coast of the United States and in the West Indies. It was labelled "Atlantic," but what locality may be meant by that, and in what way it may have got there, remains uncertain.

Pieces of succinite, as well as all other organic and inorganic things which are placed for some time in the sea, may be covered with small living marine plants and animals, such as Algæ, Bryozoa, and Crustacea. But as these are not quite the same in the German Ocean as in the Baltic, English succinite bears an external flora and fauna partially different from the Prussian. Previously, Mr. Foord in his above-named paper occasionally mentioned a small unpolished specimen of the opaque sort "encrusted with a polyzoan," that is to say, with a bryozoon. On the other hand, I know that the shells of a kind of *Balanus* often cover the fossil resin, and Dr. Weltner, of the Zoological Museum at Berlin, has determined it to be *B. porcatus*, da Costa. For instance, Mrs. A. Fox, of Cromer, possesses a light-yellow clouded piece of succinite (plate i., fig. 1), 75 grams in weight, which is covered with the shells of several animals, the largest of which has a diameter of 3 to 3.3 cm., while other specimens have fallen off. According to Dr. Weltner this species lives on the coasts of Japan, North East America, Greenland, Ireland, Scotland, South England, Norderney, Heligoland, and in the whole of the German Ocean, also in the Greater Belt, in the Belt of Fehmarn, and at the Stoller Ground, near Kiel. It may be mentioned that amber from the shores of West and East Prussia is also often incrusted with smaller shells, which belong to another species, *Balanus improvisus*, Darw. Moreover, one and the same English specimen

bears on one side the fragments of the tubes of annelids, determined by Dr. Collin, of Berlin, as *Pomatoceros triqueter* (L.). However, there is a similarly coloured second piece belonging to Mrs. A. Fox (plate i., fig. 2), which shows more and better developed tubes. It weighs 65 grams, and is covered with a group of well-preserved tubes and fragments of *Pomatoceros*. According to the same zoologist this worm lives on the coasts of Iceland and Scandinavia from Varanger Fjord to Öresund; also in the German Ocean, on the coasts of N. France, England, Scotland, and N. E. America. I remember a third specimen (plate ii.) of 135 grams, which should be mentioned here. It has a fine yellow cloudy colour, and is covered at one side with a group of about thirty shells of *Balanus porcatus*, da Costa, of various size, which partly contain the dead animals. This piece is in the possession of Messrs. Stantien & Becker, at Königsberg, who bought it from Mr. Perlbach at Danzig, and this gentleman had obtained it from the east coast of England. It should be noticed that both species, *Balanus porcatus* and *Pomatoceros triqueter*, are not found in the Baltic proper.

It is difficult to give an estimate of the quantity of amber found in England, as the pieces are almost all of small size and usually are picked up by visitors who take them away. According to the estimate of Mr. Henry Miller, of Ipswich, only a few pounds annually are found in the neighbourhood of Felixstowe, and Mr. Reid says that three or four pounds are gathered near Cromer. Therefore about four or five kilograms might be collected annually along this coast, but I am told that in old times the yield was much greater.

In spite of this small quantity of amber, quite a little home-industry has originated in England, and I am in a position to give some information on this point. In the first place, Mr. Henry Miller told me of an old woman, Jane Larrett, at Trimley, near Felixstowe, to whom the fishermen and their children used to bring all the amber picked up on the beach. She cut it into ornaments with a file, scraped it with the edge of a piece of broken glass to get rid of the scratches, and polished with soft leather and powdered whitening made from chalk. In such a manner she fashioned small articles such as hearts, crosses, and beads, threaded them so as to be worn as bracelets and necklets, and sold them to the visitors to Felixstowe in the summer. Moreover, she was able to clarify the cloudy pieces by boiling them in oil, just as is done even now in Prussia. That woman taught Mr. Miller to cut and polish amber when he was a boy, but she has been dead for many years, and there is now no one who carries on the business in Trimley. However, in other places there are some people who carry on a little home-industry; for example, Mr. Croydon, at Felixstowe, makes brooches, pins and other things, and Mr. Robert J. Candon, of Southwold, works amber found on the shore there into various articles of jewellery. One would expect the greatest industry of that kind to be at Cromer, where numerous objects are made, namely, beads, necklaces, crosses, hearts,



AMBER covered with *Balanus porcatus*, da Costa.

(In the possession of Messrs. Stantien & Becker, of Königsberg.)

[*To face p.* 104.

mouthpieces for pipes, and so on. But such articles are also imported from Germany, just as is rough amber, and I remember very well having seen in the windows there a good many specimens from Danzig and Königsberg. Of course it is cheaper to import the articles from German manufacturers, where they are worked *en gros*, than to engage a workman at home to make single objects. Still, English succinite is worked on a small scale in England. Moreover, this branch of industry is by no means limited to Prussia. Though the greatest manufactories exist there, particularly at Danzig, Königsberg and Stolp, succinite is worked in various parts of Europe; as, for example, in Russia (Polangen, Ostrolenka), Sweden (Malmö), Denmark (Copenhagen), and elsewhere.

Regarding the widely-spread occurrence of succinite, it is very probable that the marine Tertiary deposit which contained this fossil, was, in old times, not limited to the Samland, but had a much greater extension. Of course a good deal may have been carried down by the advancing of the ice during the ice age, and then by the waves, but that alone would not account for its appearance in Finland and England, in Sweden, Poland and Central Germany, here and there even in large quantities. Again, some geological observations seem to indicate that the district of the amber forests once extended over a wide area from east to west. For in several localities of West Prussia and Pomerania greensands exist similar to the Blue Earth of the Samland, though succinite has not been found in them hitherto; but the large greensand deposit of Eberswalde, near Berlin, does contain succinite. Further, in Mecklenburg, Schleswig-Holstein, Denmark, and Sweden, geologists assume that the succinite found there is derived from destroyed Tertiary deposits of those countries. Moreover, the succinite of England was not carried there from Samland, but was probably washed out of a diluvial or Tertiary bed, which is not preserved now or which is covered by the North Sea. A few specimens, as I have seen at Cromer, exhibit glacial scratches, and probably they were derived from a diluvial deposit not far from the English coast. Even those pieces could not have been brought by the glacial current from the Samland, but from another locality which was situated much nearer.

In the Newer Pliocene forest-bed of Cromer one specimen has been dug up, but it has not been possible to find another. It belongs to the succinite group, and Clement Reid thinks it may have been washed out of an older, perhaps underlying, deposit. Generally the geological structure of Norfolk, with which he is so intimately acquainted, leads him to assume an original continuity of the amber-bearing bed from the Prussian coast (Samland) to within a short distance of the English coast. For the eastward dip of the strata in Norfolk, and the thickness of the London Clay at Yarmouth, ought to bring Upper Eocene and Oligocene beds near to that shore.

It is well known that worked amber is found in prehistoric graves

in England, and it was generally supposed that those ornaments had been imported from abroad. Even Clement Reid states that the manufacture would only be understood in a district where the raw material was comparatively plentiful; I am not, however, in a position to assent to this. First it must be noticed that there are also some amber objects which are attributed to the stone age, and it is not proved that in this period a connection between the English and the Prussian coast already existed. Therefore these neolithic ornaments—if they should be foreign—could only have been brought from the Danish coast or from the German shore of the North Sea, where amber occurs a little more often; but, in general, why should Englishmen have sent for the fossil from abroad when they could get it at home? Add to this, that the working of amber is quite easy, and that we know of numerous articles of other countries which are fashioned very delicately by primitive instruments of bone and stone. Certainly the manufacture of amber is not more difficult than that of jet, whereof we know many beads and other articles made in the stone age in England. Besides, the characteristic manner of perforation of the jet ornaments is like that of the Prussian amber objects of that period, which proves anew that the same uses and methods, as well as customs, may originate in different countries, without any reference to one another. Moreover, we have learned that in England, even in these days, there exists an original amber manufacture, unchanged by foreign influence, and just in the same way the fossil could have been worked a few thousand years before.

Of course, amber is not abundant on the shore, and usually it is mixed with sea-weeds, for which reason many specimens may be overlooked, but the prehistoric articles also are rare, and "the present annual yield is more than sufficient to account for all the ancient amber ornaments yet found in England" (Reid, *l.c.*). Having regard to all these circumstances, it is simpler, on the whole, to trace the ornaments to English amber (succinite) rather than to foreign importation. Still, it may be that this and the other amber articles of the bronze and of the iron age have been brought from abroad.

H. CONWENTZ.

(To be continued.)

III.

Two Views on Museums.

AS we go to press the Museums Association begins its meeting at Glasgow, under the presidency of Mr. James Paton. Besides visiting the Corporation Galleries, the Kelvingrove Museum, and the Hunterian and other museums in Glasgow, members will have an opportunity of seeing the new museum at Perth, an account of which has been published in our pages (vol. viii., pp. 41–45). There is a strong local committee and abundance of hospitality, so that the meeting seems likely to be an enjoyable as well as a profitable one.

No doubt some of the numerous debatable questions that have been raised by Sir Henry Howorth in our pages during the past year will come up for discussion at this meeting, and we are glad to furnish as a contribution to the discussion the following note by so well-known a representative of American Museums as Mr. F. A. Lucas, of the National Museum, Washington. As an alternative to the opinions of Mr. Lucas, we venture to recommend to the assembled curators a small pamphlet that has just been sent to us by Professor Alphonse L. Herrera, of the National Museum in Mexico, to whose other attempts at reform we again draw attention in our Notes and Comments.

I.—The Skeleton in the Museum.

In the June number of Natural Science Sir Henry Howorth objects to the exhibition in museums of what Ruskin, to use his own choice diction, terms "Bones, guts, or any other charnel-house stuff." It would hardly seem necessary to protest against this snap judgment, which reminds one of the dictum of George Francis Train, "One man right, forty millions wrong," but I cannot refrain from saying that, if Sir Henry sees no good in a room full of skeletons, there is something wrong with the skeletons—or himself. Personally, I hold to the belief that all knowledge save that which tends directly to the procurement of bread and butter is a misfortune, but, being in a minority, and in a country where the majority is *supposed* to rule, I endeavour to adapt myself to circumstances. Such being the case, I try to make the exhibition series of the Department of Comparative Anatomy furnish the illustrations, and the labels the text of a work

on anatomy, and, although at present but a few chapters are outlined, I hope that at least one visitor in a thousand may leave the "Dead House" with something besides the subject for a nightmare.

It is true that anyone may learn from a text-book that the hand of a monkey and the flipper of a whale are constructed on the same plan, and that their external differences are due to the fact that one wears gloves and the other mittens. But there is nothing like the objects themselves to teach this and similar truths, especially to people who never open a book on anatomy, and to teach these truths is one of the objects of the anatomical collection. Moreover, it is one of the provinces of anatomy to show adaptation to certain ends, and if Sir Henry will come to Washington next year he may, if he wishes, see series devoted to modifications of the limbs for walking, flying, swimming, and the like, and he will find here and there skeletons bearing labels calling attention to their mechanical adaptations. But doubtless all this, and more, is to be seen at South Kensington, whose methods are my models and whose resources my envy and—almost—my despair, so I will simply touch on one other point.

If you *must* pull your skeletons out of the cupboards, where they should be decently concealed—says Sir Henry—then you should mix them with stuffed specimens, doubtless in order to hide their nakedness so far as possible, or else put them in the society of respectable fossils. That recent and fossil forms should be shown together is beyond dispute, but the manner in which skeletons are to be exhibited depends largely on the purpose for which they are displayed, upon whether one wishes to use them by themselves or as adjuncts to other specimens. For example, the case in the Index Collection at the Natural History Museum, South Kensington, illustrating the morphology of the Batrachia, seems to me magnificent, although it may contain too many bones to please Sir Henry, and yet I presume that Sir William Flower would not consider that skeletons of batrachians should not appear elsewhere in the museum. I certainly hope that he may agree with me in thinking that a large museum should contain a series of the skeletons of the higher groups of vertebrates, let us say families, from Myxine to Man. Also if one wishes to emphasise some point in the structure of an animal, to illustrate some detail of classification, or to show how little a creature's inside may have to do with his external appearance, place the skeleton where it will do the most good. But if you wish to trace the relations between various groups, to show their structural similarities or differences, to make apparent to the visitor or student the lines on which vertebrates are laid down, the room full of skeletons is a necessity. More than this, they must not be mixed up with stuffed specimens where the *comparative* purpose for which they are shown would be utterly lost, but they must be shown side by side in order that one may be compared with another, and they must be

so arranged and labelled that even the casual visitor may pick up an idea, or have one thrust upon him as he strolls through.

There is much more that might be said on this point, but once started on the question of museum installation it is difficult to tell where to stop, and so I will stop at once.

Washington, D.C. FREDERIC A. LUCAS.

II.—THE MUSEUM OF THE FUTURE.

Professor Herrera's pamphlet, reprinted from the *Memorias de la Sociedad "Alzate" de Mexico*, vol. ix., pp. 221–252, is entitled "Les Musées de l'Avenir." Of these museums we are told "there is no gallery of insects, no gallery of birds, or of mammals, or of fishes, or of reptiles; no collection of Coleoptera, no collection of Chiroptera, or of pheasants, or of pigeons. Museums of the future do not classify by classes, families, tribes, genera, species, sub-species, varieties, sub-varieties, races, and sub-races; *they put in order facts, and classify ideas.* . . . There are rooms for heredity, for ontogenesis, cænogenesis, variation, mimicry, the struggle for life, nutrition, and so on. . . . These rooms are arranged in a philosophical order, and in that order they must be visited by the public; to this end there will be barriers suitably disposed. . . . In the museums of the future the zoological specimen is the lacquey of an idea, whereas in our present museums ideas are the slaves of specimens. Thus, a specimen is not exhibited because it is rare, or because it ought to be exhibited: we show the most profound contempt for specimens that are rare, curious, or pretty. . . . The museum of the future aims at being, not a magazine of dead lumber eaten by worms, but an open book in which men can read the philosophy of nature." The first room of Professor Herrera's museum reminds us of some gruesome diagrams that used to be visible at South Kensington, showing, by coloured squares, cubes, and so forth, the amount of the various inorganic substances contained in the human body, the chief difference being that the method is here extended to the flesh of other animals. The idea of this room is to show the unity that pervades nature, whether in chemical composition, in organic matter, in organic force, in vital phenomena, in the plan of organisation, in origin, end, or in the conditions and causes of evolution. The next room displays the comparative physiology and anatomy of animals; the natural system of classification is treated with contempt; the ideas of biology are better illustrated by the association of animals living under similar conditions or using similar devices, by the comparison of analogous rather than of homologous organs, thus showing the numerous modifications and specialisations that have been adapted to a single or to similar ends. Room no. 3 is to show the various methods of reproduction, and all organs and functions associated therewith. In the next room distribution is dealt with, not, however, according to any scheme hitherto proposed.

but considered as "the correlation between the distributional areas of organisms and all the general biological conditions"; thus, we have animals from warm regions, animals from cold regions, alpine species, species from great depths, species from deserts, species from caverns, species from islands, species from forests, and so forth. Then follow exhibits showing the correlations between the present fauna of certain countries and their extinct faunas. Other cases exemplify migration, means of dispersion, and laws of geographical distribution. The next gallery is given up to evolution, and here Professor Herrera is frankly Darwinian, making no mention of neo-Lamarckism, bathmism, and other philosophical schools. Consequently, his exhibits are intended to show such facts of nature as the rapid multiplication of individuals, the struggle for existence, adaptations, sexual selection, and results of selection. In the arrangement of his specimens, in order to bring out the various ideas, Professor Herrera places them in series and places them in contrast, using either method as seems most suitable to each occasion.

The paper is undoubtedly suggestive, and it is not intended to be anything more; no doubt Professor Herrera would agree that each curator must find his ideas and work them out for himself, in accordance with the circumstances of the museum in which he is placed. Neither does he mean to deny that some such arrangement of the museum according to ideas has found its scattered instances; indeed, he does allude to some of those beautiful cases that adorn the entrance-hall of the Natural History Museum in London, exemplifying such biological ideas as variation, protective mimicry, and albinism. But it is still true that the idea which governs our museums is the arrangement in accordance with some human system of classification—"Why!" says our author, "the decimal classification that is being adopted for libraries is preferable to the natural (?) classification. It is this that will be universally applied in the museums of the future." And thus he concludes: "All I know is that if, fifty years ago, museums had adopted the philosophical and not the systematic order, then man, seeing side by side the animals of the deserts, would have discovered protective mimicry fifty years ago. Seeing together on one side the victims, on the other side the executioners, and further off the champions, he would have discovered the struggle for life, unity, selection, catabolism. . . . But from time immemorial, man has tried to imprison the things of nature in a fixed system, a fixed classification, which is not the whole of science, and which cannot be the nest of all philosophy. Nature, in her vastness, protests against the classifiers; maddened, indignant, desperate, she revolts against routine. A Darwin and a Huxley as yet have lived in vain; for we, here below, we classify, classify, classify. . . . I know that when they have visited the museums of the future, the learned, the children, the pretty girls will remain very serious, seriously meditating upon all this profound philosophy of nature, upon all her wings, upon all her nests."

IV.

Sporozoa.[1]

THE volume by Dr. von Wasielewski, recently published, is an extremely good and complete account of the Sporozoa, with especial reference to those which are permanent cell-parasites and, like *Hæmamœba Laverani*, the parasite of malarial fever, are associated with disease.

A very curious and striking fact is that, although the Germans, Kölliker, Hammerschmidt, and Lieberkuhn, forty years ago were the chief workers who had added to our knowledge of the genus *Gregarina*, established by the French entomologist Dufour, yet, with the exception of the pioneer work of Eimer, the newer knowledge of the Sporozoa is almost entirely due to French, Italian, and English observers. So that we have here, in Dr. von Wasielewski's book, a very unusual circumstance, namely, a German zoological treatise which is mainly occupied in making known and accessible to German readers the original work of French zoologists and micrographers.

In the history of research on the Sporozoa—the name given by Leuckart to Gregarinæ and the allied forms—we find, following after the fundamentally important memoir of Theodor Eimer on the Coccidia of mice and rabbits and their spore-formation, the "Leçons sur les Sporozoaires" of Balbiani, published in 1884; the numerous short papers of Aimée Schneider in his *Tablettes Zoologiques*, from 1881 to 1892; the admirable systematic treatise of Labbé "Parasites Endoglobulaires," published about two years ago in the *Archives de Zoologie expérimentale*; the researches of Thelohan on the Myxosporidia, published last year in the *Bulletin Scientifique de la France et de la Belgique*, and of Gurley on the same subject in the *Bulletin* of the U.S. Fish Commission; the memoir of Leger on the true Gregarinæ, in the *Tablettes Zoologiques*, 1892; and the original treatises of Danilewsky, Laveran, and Grassi, on the Hæmatozoa. All this and other material is freely drawn upon and reproduced in systematic form in the present volume; well executed and abundant figures are copied from original sources, and the whole subject is carefully treated, both with reference to description of particular groups and species, and as to classification and systematic nomenclature.

An idea of the range of the work may best be formed by the following outline of the classification and enumeration of genera:

[1] SPOROZOENKUNDE: ein Leitfaden fur Aerzte, Tierärzte und Zoologen. Von Dr. von Wasielewski. Pp. viii., 162, with 111 figures in the text. Jena: Gustav Fischer, 1896. Price 4 marks.

Class or Phylum. **SPOROZOA.**

Order I. GREGARINÆ.
Sub-order A. **Gymnosporea.**
Family 1. *Gymnosporidæ*. Genus.—*Porospora.*
Sub-order B. **Angiospora.**
Family 2. *Clepsidrinidæ*. Genera.—*Clepsidrina, Didymophyes, Eirmocystis, Hyalospora, Euspora, Gamocystis, Cnemidospora, Stenocephalus, Sphærocystis.*
Family 3. *Anthocephalidæ*. Genus.—*Anthocephalus.*
Family 4. *Dactylophoridæ*. Genera.—*Echinocephalus, Dactylophora, Pterocephalus, Trichorhynchus, Rhopalonia.*
Family 5. *Actinocephalidæ*. Genera.—*Actinocephalus, Geneiorhynchus, Dufouria, Bothriopsis, Coleophora, Phialis, Discocephalus, Pyxinia, Xiphorhynchus, Schneideria, Monocystis, Pileocephalus, Amphorella, Stephanophora, Asterophora, Doliocystis.*
Family 6. *Acanthosporidæ*. Genera.—*Corycella, Syncystis, Acanthospora, Ancyrophora, Pogonites.*
Family 7. *Stylorhynchidæ*. Genera.—*Stylorhynchus, Oocephalus, Cystocephalus, Sphærocephalus, Lophorhynchus.*
Family 8. *Menosporidæ*. Genera.—*Menospora, Hoplorhynchus.*
Family 9. *Gonosporidæ*. Genus.—*Gonospora.*
Family 10. *Urosporidæ*. Genera.—*Urospora, Ceratospora.*
Order II. HÆMOSPORIDIA.
Family. *Drepanididæ*. Genera.—*Drepanidium, Karyolysus, Danilewskya.*
Order III. COCCIDIA.
Family 1. *Monosporidæ*. Genera.—*Eimeria, Pfeifferia.*
Family 2. *Oligosporidæ*. Genera.—*Cyclospora, Diplospora, Isospora, Coccidium.*
Family 3. *Polysporidæ*. Genera.—*Barroussia, Adelea, Klossia.*
Order IV. ACYSTOSPORIDIA.
Family 1. *Acystidæ*. Genus.—*Karyophagus.*
Family 2. *Hæmamœbidæ*. Genera.—*Halteridium, Proteosoma, Hæmamœba, Dactylosoma, Cytamœba.*
Appendix. *Apiosoma, Babesia.*
Order V. MYXOSPORIDIA.
Family 1. *Myxididæ*. Genera.—*Sphærospora, Myxidium, Sphæromyxa, Myxosoma, Ceratomyxa, Septotheca.*
Family 2. *Chloromyxidæ*. Genus.—*Chloromyxum.*
Family 3. *Myxobolidæ*. Genera.—*Myxobolus, Henneguya.*
Family 4. *Glugeidæ*. Genera.—*Glugea, Pleistophora, Thelohania.*
Order (?) VI. SARCOSPORIDIA.
Genus.—*Sarcocystis.*
Order (?) VII. AMŒBOSPORIDIA.
Genus.—*Ophriocystis.*
Order (?) VIII. SEROSPORIDIA.
Genus.—*Serosporidium.*

The author, Dr. Wasielewski, is not responsible as an original authority for the classification put forward in each group. I have no hesitation in saying that the whole scheme, both of families and genera, adopted for the order Gregarinæ is misleading and unnatural.

It is chiefly based on Aimée Schneider's system. The form and number of the spores is about as natural a basis of classification of the Sporozoa as was the Linnean staminal system of phanerogamous plants. It is neither more nor less than absurd to place *Monocystis* with the Actinocephalidæ. The classification which I proposed in the "Encyclopædia Britannica" (Zoological Articles—Protozoa) at any rate takes account of important structural features in the full-grown active form of the organism. I do not think that at present any further division of the Gregarinæ than that into the order Haplocyta, with the single genus *Monocystis*, and the order Septata, with the two genera *Gregarina* and *Hoplorhynchus*, is useful, and it seems to me that further generic distinctions should be sought in characters of a less trivial nature than the form of the spores.

I observe that none of the recent writers have re-studied my *Monocystis aphroditæ*, a monocystic form with a long proboscis of peculiar character resembling the epimerite of some Septata. This species is not uncommon in the alimentary canal of the larger sea-mouse (*Aphrodite aculeata*), and is worth re-examination. Probably it should be the type of a new genus.

In regard to the Coccidiidea (which ought not to be called, as they are by Wasielewski, by the generic title Coccidia), the spore-containing cysts are so much more dominant in the life-history than the unencysted "Euglenoid," that there is sufficient excuse for classifying them in reference to their sporulation. But here, too, I note the omission of an interesting form described and figured by me in the article "Protozoa" above cited, viz., *Klossia chitonis*—which is extremely abundant in species of chiton on the English coast. It would come under Schneider's genus *Barroussia*.

It is also important to correct an omission by Dr. von Wasielewski of a sporozoon discovered in my laboratory at Oxford, and described and figured by Miss Pollard in *Quart. Journ. Microsc. Sci.*, vol. xxxiv., January, 1893. This interesting form is parasitic in the epithelial cells lining the intestine of *Amphioxus lanceolatus*. It is sickle-shaped, resembling a *Drepanidium*, and causes a distortion and atrophy of the nucleus of the cell in which it is parasitic. Its spore-formation has not been observed, and no generic or specific name was assigned to it by Miss Pollard.

The separation of the order Hæmosporidia from the order Acystosporidia appears to me to be unnatural. The Acystosporidia are only a step further advanced in degenerative cell-parasitism than the Hæmosporidia, and should not on that account be made into a distinct order. It may, however, be noted that Grassi thinks the Acystosporidia are not Sporozoa at all, but to be placed near *Amœba* and the Mycetozoa.

The *Drepanidium ranarum*, described and figured by me in 1871, and so designated by me in 1882 (*Quart. Journ. Microsc. Sci.*, vol. xxii., p. 53), has become the prototype of a number of blood-parasites.

Three species of *Drepanidium* are distinguished: two occurring in the red-corpuscles of frogs, and one in those of birds. *Karyolysus* and *Danilewskya* are very similar forms, the species of which occur in the blood of lizards, tortoises, and frogs. The (as it seems to me) really closely-related Acystosporidia occur chiefly in the red-corpuscles of birds, but also in salamanders, tritons, and frogs. The most important of these is the "organism of malaria," to which Professor Grassi has given the name *Hæmamœba Laverani*—after Laveran, who found it in 1880 in the blood-corpuscles of men suffering from malaria. The sporulation of the parasite was described by Marchiafava and Celli in 1888. Golgi showed that the access of fever had a definite relation to the development of the parasite. Black pigment granules, formed by the destruction of the hæmaglobin of the blood-corpuscle in which it is parasitic, are characteristic of the *Hæmamœba* of malaria. The crescent-shaped pigmented bodies seen in the red-corpuscles of malarial patients are a phase of the growth of this parasite. An account of the recent work of Marchiafava, Bignami, and Mannaberg, with drawings of various parasites of malarial fever, was given by Dr. J. W. Gregory in NATURAL SCIENCE for September, 1894 (vol. v., pp. 195–201). *Glugea bombycis* is the name now assigned by Thelohan to the "pebrine corpuscles" of the silk-worm, studied by Pasteur, and this organism is ranked among the Myxosporidia. The suggested but doubtful relationship to Sporozoa of the corpuscles observed in cancer-cells is not touched on in the present treatise.

Extremely numerous as are the parasitic Protozoa included under the group "Sporozoa," it is well to remember that there are a number which are referable to the Flagellata, and are not treated of by Wasielewski in his book. This is to be regretted, since there is very close affinity between some of the parasitic Flagellata and the blood-parasites referable to the Sporozoa. The late Timothy Lewis and others have described remarkable elongate Flagellata (*Herpetomonas lewisii*, Sav. Kent.) from the blood of rats and other animals, and, just lately, it has been suggested as probable that the Tsetze fly of South Africa owes its deadly character to the fact that it is the means of carrying a parasite, which appears to be one of the Flagellata, from one animal to another. It is to me by no means clear that these hæmatozoic Flagellata are widely separable from hæmatozoic Sporozoa, whilst some of the parasitic Monadina of Cienkowski, referred by some writers to Mycetozoa, stand very close. The three groups, Flagellata, Sporozoa, and Mycetozoa, are in many respects closely allied. Perhaps the essential cell-parasitism of the Sporozoa is the chief point in which they differ from parasitic Flagellata and from Mycetozoa. The field of work offered by parasitic Protozoa is still one which will yield most important results to the skilled microscopist with zoological training. Such works as that of Dr. von Wasielewski furnish real help to the would-be investigator.

E. RAY LANKESTER.

V.

Lyell and Lamarckism: a Rejoinder.

IF the author of "Lyell and Lamarckism: a Reply to Professor W. K. Brooks" (NATURAL SCIENCE, May, 1896), means, by the words "an explanation," on p. 331, a complete and ultimate explanation, I fully agree with him that, in this sense of the words, natural selection is no explanation of the attributes of living things, and that, "we should still want to know the true causes of them," although the fact that we "want to know" is no evidence that we ever shall know the true cause, *vera causa*, of anything.

Explanations, although imperfect, may still be valuable, even if we are never to find out "that which produceth a thing and maketh it what it is."

If it should ever be proved, as it may for all I know, that the matter which composes the known universe has been sifted out from other forms of matter by its property of weight, gravitation would remain as good an explanation of our "universe" as it is now, although we should still "want to know" how our particular sort of matter got its weight.

Darwin's work, like all good work in science, is an attempt to find out a little of the *order*, as distinguished from the *true cause*, of nature. It is a highly successful effort to study the history of living things, by means of all available evidence; and, as I understand it, the value of natural selection is quite independent of whatever we may discover, or fail to discover, concerning the true cause of that diversity among individuals which has, by an unfortunate use of words, come to be called variation.

The author of the article on "Lyell and Lamarckism" says: "According to the Lamarckian view, all adaptations, at any rate all adjustments concerning whose action and efficacy there is no dispute, have arisen in the same way as the enlargement of a muscle by exercise" (p. 330); that is, "they must be ascribed to a fundamental property of protoplasm" (p. 328); "and the assertion that structural adjustments for rendering them possible exist in organisms is just what Lamarckians contend. Therefore on this point Brooks agrees with Lamarckians; but whereas he supposes that these structural adjustments have to be explained, Lamarckians believe that they are merely the fundamental properties of protoplasm" (p. 330).

I am not sure I understand what the writer means by *structural adjustments for rendering adjustments possible*, but I suppose the structural adjustments of the human eye will be admitted as examples of "adjustments concerning whose action and efficacy there is no dispute"; and the writer is quite right in his assertion that "Brooks . . . supposes that these structural adjustments have to be explained," if they can. He might have added that I *do not suppose* the assertion "that they are *merely* the fundamental properties of protoplasm," will be generally regarded as an important contribution to the explanation.

As I understand him, the writer believes the attributes of all living things are to be deduced from the properties of living matter; an opinion which I am quite prepared to accept as soon as it is proved; for I most assuredly do not believe anything inconsistent with this creed, except that "the assertion which outstrips evidence is not only a blunder but a crime."

If it is ever proved that the attributes of all the living things which exist and of all those which have existed in the past are deducible from the properties of living matter, I do not see how we can stop here, or refuse to admit that innumerable forms, filling up all the gaps between all the known species, are also deducible from the same properties. We must also admit that this living matter contains the promise and potency of all the monstrosities which have been reared by the breeder or the horticulturist, and of innumerable abortions, the Anthropophagi and men whose heads do grow beneath their shoulders, as well as hosts of possible organisms which have, so far, laid dormant in the womb of time, and of which most may never see the light.

The first question concerning the origin of species we have to ask is, why this potency has resulted in a system of nature which is comparable to a tree, with diverging branches, and empty spaces, widening as time goes on, between them—instead of a spherical shell of individuals growing outwards in all directions from a common centre.

According to Darwin this is the outcome of a process of extermination, which must lead to this result whether there is or is not an agency which draws out definite combinations from that wonderful Pandora's box, the potency of living matter.

A species consists of a number of similar, but not identical, individuals, grouped about a mean according to the statistical "law of error," and the characteristics of each individual are what the students of statistics call an "event."

According to Darwin the influences which determine each "event" have nothing to do with the character of the type, as this is fixed by the standard of extermination. To the question whether specific types are inherent in living matter or external and objective to it, he answers that they are both; that they are inherent insomuch as all their data, or "events," are properties of the physical basis of

life; but that they are external insomuch as the agreement of the "events" with the "law of frequency of error" is the effect of the environment.

When embryologists talk about the doctrine of evolution in embryology as antagonistic to the doctrine of epigenesis; when biologists seek for the origin of species in laws of variation which are not the outcome of selection; when they talk about a "principle of organic stability," which does not owe its origin to the same mechanism—it seems to me that they fail to grasp the significance of Darwin's work, and that they are wandering from the only path in which we can have any well-grounded hope for progress; the path which takes its departure in that conception of specific types which leads us to seek for the origin of the "events" that exhibit the type in the structure of living organisms, and to seek in the order of nature external to the organism for the origin of that "law of error" which picks out a type from among these events.

The specific types of the zoologist and the botanist have peculiar interest since they persist from generation to generation, according to what is known as the law of specific stability; while they also undergo slow changes according to the principle of the mutability of species. In popular language specific stability may be said to be due to inheritance, and specific mutability to variation; but in this connection these words have only a loose meaning, and it has long seemed clear to me that much of the current misconception of Darwin is due to the fact that, in his desire to make clear the analogy between natural and artificial selection, he borrowed these words from the breeders without due deliberation.

In so far as they give the impression that the stability of species and the mutability of species are antagonistic to each other, that they are due to two distinct and opposing influences, or that the individual which is preserved is a "variation" in any sense which is not equally applicable to the one which is exterminated, these words are unfortunate; for, notwithstanding Darwin's words, his context shows clearly that he looks at both the stability and the mutability of species as due to the same influence—the extermination by natural selection of certain individuals, and the preservation of others and their progeny.

While a recent writer in NATURAL SCIENCE (Nov., 1895) holds that sexual reproduction is the cause of types, all students of the subject are perfectly familiar with the fact that data drawn from any source, living or dead, may conform to a type, and the excellence of natural selection is not that it explains the existence of types, but that it explains a distinctive peculiarity of the particular sort of types which concern the zoologist and the botanist. These types not only persist from generation to generation, but they also exhibit fitness. It is this fitness, and not mere conformity to the statistical "law of error," which calls for explanation, and gives to biology the rank of an

independent science, distinct from the physics and chemistry of the living body. It is in this that we find the great excellence of Darwin's explanation of the origin of species by the extermination of the unfit and the survival of the relatively fit; for he shows that the fitness is determined by the external world and not by any inherent property of fitness, or of unfitness, in those which are preserved, or weeded out, since a difference in the external world might have reversed the result.

The motive of my own letter on "Lamarck and Lyell," which has called forth this "Reply," was not love of controversy, but a natural desire to protest against the statement, which has appeared in a book, that I am one of the prominent advocates of Lamarckism.

Since I "have quite failed to understand the Lamarckian view," the author of the "Reply" suspects strongly that I have not tried, though I hope he will credit my assertion that my failure is not due to lack of effort, but to the incompetency of this effort to bring about the desired result.

My studies seem to show that Lamarckians believe (1) that effort, use and disuse, and the direct action of the conditions of life, are adequate to explain all the phenomena of fitness, and that natural selection is superfluous; (2) that natural selection is useful as a means for preserving what the Lamarckian "factors" supply, but that it originates nothing; (3) that these "factors" account for the "incipient stages" which are seized upon and culminated by natural selection—that they press the button, as it were, leaving natural selection to do the rest; and (4) that species are exactly like inorganic types, and that the opinion that they are distinguished by fitness is erroneous.

If failure to discover which of these is the "Lamarckian view" is failure to understand this view, I frankly admit that I have "quite failed," although I regret this the less since all these hypotheses seem to me equally unsatisfactory. I do not know how many hold the opinion that the conception of fitness, as distinctive of species, is erroneous, but as I hope the common sense of most will ultimately hold a fretful few in awe, I shall not dwell upon this point of view at present, except to call attention to the familiar fact that the phenomena of geographical distribution are inexplicable unless species are more or less fitted for that state of life to which they are born.

As regards the hypotheses which I have numbered 1, 2, and 3, it is clear that unless the "Lamarckian factors" can be proved competent to explain the incipient stages of useful structures, they cannot be competent to do what 1 and 2 attribute to them. I therefore ask, in my letter on Lamarck and Lyell, for evidence that the influence of the so-called Lamarckian factors is beneficial, and I asserted that I learned, from the study of Lyell's "Principles of Geology," to ask for

this evidence, and to refuse, in its absence, to admit that these "factors" explain even these incipient stages.

I had supposed that, by their "factors," Lamarckians meant use and disuse, effort, and the direct action of the conditions of life, but as I have "quite failed to understand" their views, this may be a mistake. At any rate, instead of giving evidence that the influence of these conditions is beneficial, the author of the "Reply" tells us all adaptations must be ascribed to the fundamental properties of protoplasm, although this statement, while it may be true, has, in the present state of our knowledge, no more claim to be called an explanation than the assertion that the origin of steam engines is to be ascribed to the fundamental properties of matter; an assertion which may also be quite true for all I know to the contrary, although it will be soon enough to accept it as a belief when some one deduces a steam engine from these properties.

This writer objects to my statement that I learned from Lyell that the Lamarckian factors could not be accepted unless they could be shown to be inherently beneficial, since he is not able to learn anything of the sort from this author; although I suppose my statement will be justified if I can show that others, including Lyell himself, have made the same deduction from his teaching. His biographer in the Encyclopædia Britannica, after speaking of his mastery of the work of Darwin and Wallace, says: "Then it was that Lyell, who had rejected Lamarck's theory because it rested on a purely imaginary law of *innate progressive development*, at once accepted natural selection."

Darwin's letters show, however, that this acceptance did not come "at once," but that Lyell had much difficulty in perceiving the fundamental difference between Darwin's views and those of Lamarck, and that he for some time thought his criticism of Lamarck applied to Darwin also. After Lyell had read the proof sheet of the "Origin of Species," Darwin wrote to him as follows, Oct. 25, 1859, in answer to a letter which, unfortunately, is not printed in either Lyell's or Darwin's "Letters": "Our difference on 'principle of improvement' and 'power of adaptation' is too profound for discussion by letter. If I am wrong, I am quite blind to my error. If I am right, our difference will be got over only by your re-reading carefully and reflecting on my four first chapters. I supplicate you to read them again carefully."

Darwin is no doubt right, and anything further is a waste of words; for those who are not persuaded after reading and reflecting on these four chapters, remind one of the five brethren of a certain rich man mentioned in history.

W. K. Brooks.

SOME NEW BOOKS.

Judd's Lyell.

The Student's Lyell: A Manual of Elementary Geology. Edited by John W. Judd. 8vo. Pp. xxiv, 635, with a geological map[1] and 736 illustrations in the text. London: John Murray, 1896. Price 9s.

It will be a sad day for the learners of geology when the lucid and suggestive writings of the great geological philosopher are pronounced to be altogether too behind the times to have an educational value. In so rapidly advancing a science such a probability is not very remote, and we are proportionately grateful to those who, like the late Martin Duncan, and the present editor, Professor Judd, do their best to bring the well-known "Student's Elements" up to date. It is a thankless task to revise the writings of a previous author, especially when they have the fame and the individuality possessed by the writings of Sir Charles Lyell; but among British geologists there are few whose grip of the science in its physical aspects would fit them for the work so well as the learned Dean of the Royal College of Science.

The original plan and methods of the book are followed, including the arrangement that naturally commended itself to the prophet of uniformitarianism, of beginning with the newer rocks, less altered than the older ones and deposited under conditions less different from those of our own day. Much, however, has been added to the text and much has been altered; this is especially observable in the portions dealing with stratigraphy and petrography. To accommodate the additions, the more detailed matter is printed in smaller type, some of it being in double columns. This has the advantage of marking for the beginner those portions that he will be wise to omit on a first perusal, and to study when reading through the book a second time, on which occasion it might be as well for him to reverse the order of the historical systems and to take the oldest first. On the whole, this additional matter seems to us worthy of the honourable place that it occupies, and if we think that some sections are a little too detailed while others are not dealt with fully enough—well, we also know that this is a matter on which no two geologists would be agreed. For the mere sake of illustrating our meaning, we would suggest that half-a-page is not quite enough to devote to the whole Palæozoic basin of Bohemia, the rocks of which were laid down in a different sea under far other conditions than those of Britain, and, thanks to Barrande, form the type for all the Palæozoic rocks of south-eastern Europe. Again, if it be necessary to give, as on p. 336, a table of correlation of the Mesozoic rocks in different areas, we fail to see why the large series of such rocks in North America should be represented by only "Freshwater Strata of Western Territories,"

[1] We give this on the faith of the title-page: there is no map in the copy sent to us; further, owing to a misprint in the signature, sheet D D has been wrongly folded.

"Greensands of New Jersey," and "Newark Formation"; the account given in the text, though by no means exhaustive, is far more detailed than this. However, it is right and in accordance with Lyell's methods that the British student should learn his lesson from the sections exposed in his native land, and the facts of British geology are clearly and accurately set before him.

But when we consider the palæontology, which, to judge from the abundance of figures of fossils, is intended to form no unimportant feature of the book, we find that Professor Judd shares the ultra-conservative opinions of nearly all British geologists, especially those in official positions. Let us examine some of the said figures. A few are new and good, as those of the Triassic reptiles, *Lariosaurus*, *Hyperodapedon*, and *Tritylodon*, but most are old friends that have nothing but antiquity to recommend them. The erroneous restoration of "*Aechmodus*" (= *Dapedius*) by Agassiz is reproduced on p. 278, although more accurate ones have already reached most text-books. It should have been stated that the restoration of "*Megalosaurus bucklandi*" on p. 282 was a work of pure imagination, based on Marsh's *Ceratosaurus* from North America. Pages 380 to 382 are crowded with caricatures of fish from the Old Red Sandstone, though we thought they had been exploded long ago; of these, Hugh Miller's drawing of *Pterichthys* is the most dreadful, and is made worse by the legend, which describes as the mouth a depression that may be the orbital opening or a slime canal; it would have been easy to borrow Traquair's excellent and accurate figures of this interesting creature. The engravings of invertebrate animals and of plants are those with which we have been familiar for the last fifty years, and it is cruel to keep them from their well-earned retirement. So famous a publishing house as Mr. John Murray's could surely spend a few pounds on modern clichés, even if it could not afford to pay an artist. The drawings of *Stringocephalus*, for instance (fig. 540), give a very false idea of the well-known deltidial structures to which such importance is now attached. *Granatocrinus ellipticus* of our Mountain Limestone is represented by an incorrect drawing labelled "*Pentremites*": it is really time that our students should be taught that *Pentremites* does not occur in Britain at all. So, too, the figure said to be *Cypridea*, on p. 272, might have yielded to one of those long since published by Rupert Jones. But if impecuniosity may be put forward as an excuse for the absence of decent illustrations, it cannot explain away some of the remarkable statements in the text. *Nipa* is not confined to "the Molucca and Philippine Islands, and Bengal," but is found in Ceylon, Borneo, and New Guinea as well. It is said to be "allied to the cocoanut tribe on the one side, and on the other to the *Pandanus* or screw-pine," a sentence that we hope Professor Judd will explain to his own pupils if not to others. *Ptychodus*, we are told, "is allied to the living Port-Jackson shark, *Cestraceon* [*sic*] *Phillippi* [*sic*]"; though it is now generally admitted to be related not to *Cestracion*, but to the skates. *Archegosaurus minor* is described on p. 366 as from "the Coal-measures, Saarbrück"; but the coal-deposits of Rhenish Prussia were long ago proved to be Lower Permian. The following remarkable sentence was not, we believe, written by Lyell, and we cannot imagine where Mr. Judd found anything so erroneous:—"The Echinodermata of the Silurian include great numbers of Crinoids, all belonging to the Palæocrinoidea or Tesselata [*sic*], in which the plates composing the calyx are fused together." And a little further on it is still said that "several peculiar species of *Cyathocrinus* are found in the Wenlock Limestone," although Bather showed two or three years

ago that this was one of the rarest genera in that formation, being represented by very few specimens of only two species. On p. 405, *Plectrodus mirabilis*, from the Upper Ludlow bone-bed, is described as "the jaw and teeth of a predaceous" fish; but it is many years since this was proved to be simply the denticulated edge of a cephalaspidian shield. The *Cyathaspis* recently described by G. Lindström is wrongly ascribed to the "Gothland Limestone," which Mr. Judd, on another page, rightly makes the limestone equivalent of our Ludlow beds; the fossil was really found in shale correlated by Lindström with the Wenlock Shale. *Trimerella* and *Siphonotreta* are far from being confined to the Ordovician of Russia and North America: the former comes from the Upper Silurian and, among other places, from Gotland; the latter is found in the Llandeilo and Wenlock beds of our own island.

Perhaps the foregoing examples are enough both for our readers and for the author. Now, Professor Judd does not, we understand, profess to be a palæontologist; but palæontologists do exist in this country, and, as they are not rich as a rule, one of them might have been induced by a small fee to check the palæontological portions of this book so as to make them worthy accompaniments of the general geology. We refuse to believe that "the convenience of the student" is consulted by retaining an obsolete classification of animals, a rejected nomenclature, illustrations that were necessarily made in the absence of our modern knowledge, and a mass of errors that would cause even an elementary student to be ploughed in his first examination. Let us hope that it will be long before Lyell vanishes from our class-rooms, and that Professor Judd may be able to bring out yet another edition on less conservative lines.

THE EVOLUTION OF THE HOMINIDÆ.

ETHNOLOGY. In two parts: I. Fundamental Ethnical Problems. II. The Primary Ethnical Groups. By A. H. Keane. Cambridge Geographical Series; General Editor: F. H. H. Guillemard. Pp. xxx., 442, with illustrations. Cambridge University Press, 1896. Price 10s. 6d.

CAMBRIDGE University has the most laudable ambitions, the most excellent intentions. Its scientific members are producing a series of Manuals, a Natural History, and now a Geographical Series. This last is under the editorship of so travelled a naturalist as Dr. F. H. H. Guillemard, and it is, we gather, intended to introduce to English readers the modern science of Geography, which hitherto we have had to learn from peripatetic lecturers. The aim is worthy.

The first volume of this new series deals with the science of Ethnology, not with Ethnography, which is mere "literature" and "purely descriptive," and not with Anthropology, which is more "technical and special," while Ethnology is "more all-embracing." The author at all events grasps the lofty ideals of the series, and does not forbear to magnify his office. Evolution is his watchword, his "golden skeleton key." "*L'heure des grandes synthèses*," he quotes, "*a déjà sonné*. Such a synthesis is here for the first time attempted in the English language." There is much truth in all this; a book on these lines was wanted, and we applaud the attempt.

But when we pass from promise to performance, we are disappointed, perhaps just because the author "doth protest too much." The subject is wide and complicated: the synthesis no easy task. Mr. Keane's knowledge of linguistics and obviously wide reading would have qualified him for it, if only they had been associated with

a scientific mind and an appreciation of the needs of learners. The misfortune of the book is that it has been written by a library student, who has not had either the advantage of teaching the subject, or, apparently, any practical experience in anthropological investigations, and who, therefore, could not appraise the value of much of the evidence he so diligently garnered, or check the statements that he copied. We have no wish to be hypercritical, nor do we wish to cast all the blame upon the author; a man can no longer be proficient in all branches of knowledge. But, as we have often maintained, a book for beginners should not contain obvious errors, and we cannot withhold censure from the University Press and from the Editor for passing an unusually large number in the present work. If Mr. Guillemard did not feel quite certain on some points, he could easily have asked experts to help him. The presence of pigment "under the second (Malpighian) skin"; the increase of pigment due to "excess of vegetable food, yielding more carbon than can be completely assimilated" (p. 171); the effect of "a volcanic environment like that of Java" in causing early man "to shed the wool and retain the sleek hair" (p. 263); "spiders and other insects" (p. 52): these ideas would surely not pass muster in the Cambridge biological schools. The geology is equally quaint: "Trenton, Niagara, and other formations, doubtfully of Silurian age"; *Eozoon* "is now known to be a mineral" (p. 52); "the few or no traces of glaciation" in the Chalk, Carboniferous and older periods, are due to "exceeding high temperature" (p. 59): but "Croll, reasoning with the intuitive genius of a Kepler" is a spectre from the past that we thought had been laid at Cambridge for ever. Other examples that we might select are, perhaps, due to carelessness, but that is not less culpable. Thus, zoologists are said to "detach from the Class Mammals the large and widespread group of Apes and Half-Apes" (p. 17); on p. 144 the skull of *Pithecanthropus* is said to show "characters intermediate between gorilla and Neanderthal," while on the next page the Neanderthal calvarium is described as "altogether the most ape-like skull hitherto discovered"; and, inexcusable in a book that is nothing if not evolutionist, A. R. Wallace is hailed as "one of the originators of the doctrine of evolution" (p. 32). This last sentence suggests that the author is as unacquainted with the history of philosophy as he is with the ideas of zoology. The family-trees of the human varieties are very useful in explaining Mr. Keane's views as to relationships; but the number of roots with which he has provided each one, even that of the Hominidæ, suggests to the zoologist that the author maintains the polyphyletic origin of man, though that is far from his intention. There is pedantry in the frequent use of the term Hominidæ, and a specious precision in speaking of *Homo Mongolicus*, *Homo Americanus*, etc.; any biologist would naturally assume that these were names of species, but after some trouble he would find that Mr. Keane was abusing technical terminology by referring to varieties, and not species, in this manner.

We sympathise with Mr. Keane in his attempts to extend the antiquity of man. Still, we may suggest to him that, when discussing Dr. Noetling's discovery of chipped flints in Burma, he should not have overlooked Mr. R. D. Oldham's criticism (NATURAL SCIENCE, vol. vii., p. 201, September, 1895).

Mr. Keane has made linguistics a great feature of the book, and deals lucidly with the relation of stock languages to stock races, and with the evolution of the various morphological orders of speech. We cannot profess to criticise him here, though we note that he runs

counter to certain recognised authorities. The future will show whether he has really proved some of his positions; in the meantime, we may give him credit for attempting to make the most of his special knowledge in this department. We venture to think, however, that a considerable portion of Part I. might have been omitted, as bearing more upon "special anthropology" and archæology, and the space thus saved might have been devoted to the main object of the book as suggested by its title. But the marrow of the book, "la grande synthèse," is the construction of a phylogenetic tree of the human race, complete to its minutest twigs. The attempt, even were it less successful, would be of value, and the fact that it is in many places open to criticism chiefly shows how much opinions still differ on important points. In this part, chapter xii., on "*Homo Mongolicus*," is the most interesting, as giving us a discussion of the Finno-Tatar, Chuckchi, Japanese, and Malay racial problems, with the author's original views.

In the preface, Mr. Keane apologises for dogmatism; but there are two ways of being dogmatic, one is to take decided views and go straight to the point on their assumptions, the other is to lose the point in abundance of controversy and criticisms of those who think differently. It is the latter method that is here adopted, and it does not put the reader into a good temper. Surely it was unnecessary to labour the point of evolution as against the "*deus ex machinâ* view"; or to pass from an attack on *Dryopithecus* to criticism of unorthodox theologians, de Quatrefages, and the "Dauertypus." The student wants his synthesis, right or wrong; he is only puzzled by this abundance of learning, and by the arguments against all the other synthetists. Nevertheless, the book fills a gap, and its second edition, with the obvious errors set right, will doubtless come nearer the ideal of the author and of the University.

Cephalopods of the North Atlantic.

RÉSULTATS DES CAMPAGNES SCIENTIFIQUES ACCOMPLIES SUR SON YACHT PAR ALBERT IER, PRINCE SOUVERAIN DE MONACO, FASCICULE IX. Contribution à l'étude des Céphalopodes de l'Atlantique Nord. Par Louis Joubin. Pp. 63, 6 plates. Monaco, 1895.

THE present memoir treats of eighteen species of cephalopods, three of which are indeterminable and five new. All were captured between 5° and 45° W. long. and 37° and 49° N. lat., principally in the Bay of Biscay and in the neighbourhood of the Azores; in fact, the seas surrounding these islands have furnished so large a percentage of the collection that Dr. Joubin has devoted the first section of his work to a statistical discussion of their cephalopod fauna, from which it appears that fifteen species have now been recorded, two of which here appear for the first time. Most of them are widely distributed forms, so that their occurrence in this particular locality does not call for special comment.

Passing to the systematic portion of the work, we note that fragments of an example of the rare *Alloposus mollis* were found upon the surface, where the animal appeared to have been attacked by a number of cetaceans, whose movements directed attention to the spot. It was perfectly fresh, and plate 6 shows its natural colours after a sketch by the Baron de Guerne. The softness of its tissues was such that it would probably have passed in fragments through an ordinary trawl. Some fragments of this specimen and of another suitably preserved enabled the author to make some observations on its

histology. He found a thick gelatinous coat, in structure like the umbrella of a medusa, traversed by fibres regularly arranged and in a direction normal to the surface of the body. Very remarkable is the record of a male *Rossia macrosoma*, which presented no trace of hectocotylisation, although it was full-grown and well preserved; its sex was ascertained by dissection. In the matter of hectocotylisation, moreover, it is strange to find a specimen of *Octopus macropus* recorded without note or comment as having the third *left* arm thus modified. There is possibly a little confusion here, for we find both third and fourth arms put down as dorsal, but if the facts be as stated the specimen should be referred to the genus *Scæurgus*.

The species which Dr. Joubin has called *Trachelotenthis Guernei* certainly cannot be referred to that genus, for it has the connection between the funnel and mantle characteristic of *Ommastrephes*. The author is also mistaken in thinking that a cartilaginous plate is shown in pl. 28, fig. 7, of the "Challenger" *Report*; the white lines merely indicate the superior muscles of the siphon. Several pages are devoted to a description (reproduced from a previous communication in *Bull. Soc. Zool. France*) of the curious organs discovered in *Chiroteuthis Grimaldii*, believed by the author to be thermoscopic eyes. This theory can hardly be regarded as demonstrated, but Dr. Joubin's arguments are ingenious and plausible, and it is difficult to find an alternative hypothesis that so well fits the observed facts.

Dr. Joubin's writings have made us acquainted with many interesting forms of Cephalopoda, and have also thrown much new light on those already known, and the appearance of this beautifully illustrated and sumptuously printed memoir will still further enhance his reputation. W. E. H.

British Wasps and Bees.

The Hymenoptera Aculeata of the British Islands. A descriptive account of the Families, Genera, and Species indigenous to Great Britain and Ireland. By Edward Saunders, F.L.S. 8vo. Pp. viii., 391, 3 plates. London: L. Reeve and Co., 1896. Price 16s.

The systematic study of the aculeate Hymenoptera has not attracted so many English entomologists as the importance and interest of the group would lead us to expect. Mr. Edward Saunders has probably gained a large proportion of the existing devotees by means of his "Synopses," published some years since by the Entomological Society. It is to be hoped that the book now under notice will be even more successful than the previous work, on which it is based. We note in the preface that the author expresses a hope that "the coloured figures in the larger edition of this work will remove, at any rate to a certain extent, the apparent difficulties of the subject"; this hope we echo most heartily, but if the larger edition (which we have not seen) is richly illustrated with a view to enticing future students, then we fear it may fail in its object. Hundreds of boys collect and think that they are interested in butterflies and moths; not one in a hundred makes an intelligent study of them, nor does the collecting instinct survive the attainment of manhood. Why is this? We unhesitatingly assert that it is due to coloured plates in works on Lepidoptera. By their means captures can for the most part be identified with a minimum of observation and a complete absence of scientific study; thus the mind is not trained, and what little interest there is soon flags —the collection is abandoned to its fate in common with stamps, marbles, *et hoc genus omne*. These strictures do not apply to the work

before us, and they are only made to point out what experience has shown to be the result of too copious illustration, viz., defeat of its own object. We venture to think that of those who have put their hand to the hymenopteran plough extremely few have looked back, and this result is largely due to such books as this of Mr. Saunders. Three plates only are given here: the first is an excellent "structural plate," which will be most useful to all students; the other two are entirely devoted to mouth-parts. We rather regret that a place could not be found for a reproduction of the genital armatures which are figured in the Synopses, if only for the convenience of having all within one cover. In general arrangement but few alterations have been introduced into that adopted in the Synopses, though minor changes are numerous. Four sections are now recognised instead of two; Kohl's arrangement of the Sphegidæ is adopted; several families, *e.g.*, Crabronidæ, are no longer admitted, while others are created, *e.g.*, Eumenidæ to include *Odynerus* and *Eumenes*, Colletidæ to include *Colletes* and *Prosopis*; the Acutilingues are divided into two families—Andrenidæ and Apidæ, the former including *Nomada* (Perez notwithstanding), *Panurgas*, *Dufourea*, and *Rophites*, in addition to the six genera so included in the Synopses. Specific names have undergone considerable change, particularly in the genera *Andrena*, *Bombus*, and *Cerceris*; altogether there are some thirty such alterations, which generally consist in adopting names previously quoted as synonyms, though in a few cases old species are split up, and in fewer still they are "lumped." About a dozen new species are admitted as British, and of these seven belong to *Sphecodes*. The notes on habits are admirable, and it is agreeable to find that all dimensions are now uniformly stated in mm., and that the authorities for localities are given. Inaccuracies are extremely few—two occur in the account of the Vespidæ: (1) p. 151, "six species [of *Vespa*] occur in this country"—seven are given in the table immediately below; (2) The large female cells are not *always* in the lowest tier of the nest, but may be added anywhere, as Dr. Ch. Janet has shown. The introduction contains much valuable information on Anatomy, Collecting, etc. A few of the sentences are, however, somewhat obscure and awkwardly expressed: *e.g.*, p. 5, "there seems to be doubts"; "the nervous system . . . consists of a system of ganglia united *along the centre* of the insect by two longitudinal cords"; "the circulatory system consists of a dorsal vessel, which lies along the back of the abdomen, from which the blood is circulated"; p. 6, "the respiratory system is *carried on* through the agency of spiracles"; p. 7, "head large, but varying little" should surely be "varying but little." The adjective "classificational" (p. 10) strikes us as cumbrous, and we rather take exception to the use of the plural "tarsi" to express a single tarsus of many joints.

Apart from these very slight blemishes we have nothing but praise for the book, and wish it the success that it thoroughly deserves. O. H. L.

THE BUTTERFLY HUNTER IN FRANCE.

L'AMATEUR DE PAPILLONS. By H. Coupin. Pp. vii., 329, with 124 cuts. Paris: Baillière, 1895. Price 4 francs.

THIS handy little work contains a series of useful hints upon the practical methods of catching or rearing insects for the cabinet, among which hints is scattered some information upon the anatomy and the life-history of insects in general, and Lepidoptera in particular. There is of course the inevitable chapter upon mimicry, protective

resemblance, and so forth; but as this has made the fortune, intellectually speaking, of the entomologist, and has raised him from former obscurity, we can hardly blame the author, especially as it does not interfere with the real object of the handbook. The only definite fault indeed that we can find with Mr. Coupin's book is that it is written in French; as there are so many English books of a similar scope we cannot predict for it a large sale in this country; but we should be quite glad to be mistaken.

Plants of the Lowlands.

The Flora of Dumfriesshire. By G. F. Scott-Elliot, M.A., F.L.S. With map. 8vo. Pp. xl., 219. Dumfries: Maxwell, 1896.

Finding his county to be "an extremely unnatural one," Mr. Elliot has not confined his work within political boundaries, but has included in the flora the whole drainage area of the Nith and Annan, with the upper portion of Eskdale. The last-mentioned, between Langholm and Canobie Bridge, is described as "the most beautiful wooded valley that the writer has seen in any part of the world." The flora includes seed-plants and vascular cryptogams, numbering (as we learn incidentally from the paragraph on insect visitors) nearly 900 species. Its chief feature is found in the notes on habitat and exposure as well as lists of the insect visitors, which are appended to many of the species. These notes represent a large amount of valuable work, but are still, as the author admits, far from complete. The book in its present state will, however, be of much help to future workers, to whom we must look for a more complete elucidation of the factors of environment, a systematic study of which has hitherto been sadly neglected. It is only by careful study in this direction that we can hope to solve the problems of plant distribution and evolution. We would suggest, however, that the list of visitors would be more useful if the individuals were classified under a few heads, as *e.g.*, moths, bees, flies, etc. A string of specific names conveys but little information to the ordinary botanist. In the collection of facts like these Mr. Elliot has received much assistance, which he duly acknowledges. In the introductory chapter we find, also, a section on the Hymenoptera of Mid-Solway by R. Service, and one on the geology of the district by B. N. Peach and T. Horne. The points most open to criticism relate to general arrangement and nomenclature. Such are the insertion of a period between the name of the species and its author, the occasional omission of the latter, and the misuse of the capital for specific names. We find *Trollius Europæus*, *Platystemon Californicum*, *Meconopsis Cambrica* but *Papaver rhœas*, *Aconitum napellus*, *Cheiranthus cheiri*; and *Solanum Dulcamara* but *Atropa belladonna*. "Escapes" might, with advantage, be in different type from indigenous species. If the author will pay attention to these and similar points (popular names, for instance) in future editions, the value of the work will be enhanced. A chapter might also be added, giving a general classified account of the flora as a whole, showing the proportion of rarer British plants, and bringing out relations which must exist with other parts of the British Isles.

Sunday-school Botany.

How Plants Live and Work. By Eleanor Hughes-Gibb. 8vo. Pp. xii., 115, with 30 figures in the text. London: Griffin, 1896. Price 2s. 6d.

This little book is further described on the title-page as A simple

Introduction to real life in the Plant-world, based on lessons originally given to country children. In her preface the author tells us that the study of plant-life has been one of the keenest and most unfailing pleasures of her life; it was with a view to awakening the same interest in "the dear green world around them" that the notes, from which the book has grown, were made for a course of lessons to village children. Others who have the opportunity for, and are willing to take up, similar work could hardly have a more satisfactory primer than the subject of our review. The child's attention is first secured, and then, in language simple, yet scientifically accurate, the first lessons in plant-life are set before it, its growth and development, its nourishment, and its movements. Then, in the second part, the little students learn something of plant-structure and some details of the work of assimilation. Errors are rare; we may mention, however, that "perisperm," in Lesson II., should be "endosperm," the term in general use for the stored nourishment of an albuminous seed.

CRYSTALS IN THE SCHOOL-ROOM.

CRYSTALLOGRAPHY FOR BEGINNERS; with an Appendix on the use of the Blowpipe and the Determination of Common Minerals. By C. J. Woodward. Pp. vi., 164, with 75 woodcuts and 4 plates. London: Simpkin, Marshall, 1896. Price 4s. 6d.

DURING recent years a remarkable and significant tendency has been evinced by the more progressive science teachers, to assign a rather subordinate position to the absorption of mere facts, and to make the acquisition of logical habits of thought and of accurate expression the main ends of an elementary education in science. This salutary tendency, which is, perhaps, merely the reaction against classical and traditional methods, is nowhere more apparent than in the teaching of physics and chemistry, and it is at least curious that the great adaptability to modern methods possessed by the related science of crystallography has not been more generally recognised. So much elementary geometry and trigonometry might be taught, and so valuable a faculty for visualising problems in tridimensional space might be acquired with ease and pleasure by experimentally illustrating these subjects with crystallographic examples.

Mr. Woodward seems to have had some such facts as these in view whilst compiling his little work. He first directs the attention of his students to obvious geometrical relations noticeable on crystals which they have themselves prepared, and catechises them on the immediate consequences of their observations; the students are then told to measure angles upon their crystals with the aid of a rough contact goniometer of their own construction, and to examine in an elementary sort of way the optical properties of the crystals by means of a home-made polariscope. Although the idea involved in work and thought of this kind is not carried to nearly such an extent as we should think advisable and possible with very young students, yet the combination of actual hand-work with deductive reasoning demanded from the student must go far towards giving him that self-confidence and easy manipulation of facts and things which every science-student must possess, and without which he is a failure.

The book is clearly written, although in parts a little expansion would have materially conduced to simplicity. A few errors are noticeable, such, for instance, as the statement, on p. 55, "that the symbols of all planes in a zone have two of their indices always in a constant ratio"; that this is erroneous is obvious, from the fact that

any two faces, such as (2 3 4) and (5 6 7) can form a zone, and if two sets of any three whole numbers be taken, it is not true that the ratios of two numbers of each set are in general the same.

Instructions are given and "nets" provided for the making of crystal-models illustrative of the chief forms and of the crystals which the student meets with during the lessons; these will do good service. We are less sanguine regarding the utility of the appendix on the blowpipe determination of minerals.

Arrangements have been made for issuing a small set of specimens and apparatus for use with the book; these consist of appropriate crystals of common substances to illustrate each crystalline system, and of simple materials for illustrating crystallographic optics and thermal conductivity. The set will doubtless be of use to students who have to study without assistance, or who are unable to obtain the requisite common minerals. W. J. POPE.

SELBORNE FOR CHILDREN.

THE NATURAL HISTORY OF SELBORNE. By Gilbert White, with an Introduction by Edward S. Morse. Abridged. 8vo. Pp. xvi., 251. Boston: Ginn & Co., 1896.

GOOD wine needs no bush, and Gilbert White no commendation. We may, however, notice the handy little edition of the "Natural History of Selborne," which Messrs. Ginn and Co. have just published in their series entitled "Classics for Children." A gentleman at the British Museum has lately had the enterprise to produce a volume entitled, we believe, "The Brownings for Babes." We suppose that it will not be long before we have "Boëthius for Boys" and "Newman for the Nursery." In the present series, among the familiar Andersen, Grimm, and Goldsmith, are to be observed such unexpected authors as Lord Chesterfield, Epictetus, Samuel Johnson, and Marcus Aurelius. For our American nephews and nieces we will not venture to speak, but if our own English children are to be considered, this series demands a precocity which we fear they do not possess. Gilbert White, however, is an author whose introduction into the school-room, or, we should prefer to say, the play-room, can produce none but good effects. Complaints have of late years been numerous that the observant naturalist of the old school is dying out, and is being replaced by the section-cutter and the planter of phylogenetic shrubberies. Collectors are turning their attention from butterflies, birds' eggs, and fossils, to posters and postage stamps, being, we suppose, frightened by the extensive learning now required of those who would pursue the paths of science. We must endeavour to recapture this wasted energy, and without making the claims of science less, to make the love of nature more. As a helper in so worthy an attempt, we welcome this clearly-printed and not over-annotated edition of Gilbert White's famous letters. The country parson is left to speak for himself, with the omission of "certain passages objectionable on account of the plainness of the language, many Latin words, phrases, and quotations, and a few paragraphs of no special worth or interest to the reader of the present day." The explanation of such Latin words and scientific terms as inevitably remain is left to the teacher or parent. Incorporated with the letters are some passages usually printed separately under the heading of "Observations on Nature." Thus the author is made his own commentator.

THE COMFORTABLE WORD.

THOUGHTS ON EVOLUTION. By P. G. F. 8vo. Pp. 88. London: Swan Sonnenschein & Co., Ltd., 1896. Price 1s.

THIS little pamphlet is a defence of the ethical aspect of evolution, in opposition to the thesis of Huxley's "Evolution and Ethics." The criticism of the Romanes lecture that we published exactly two years ago contains the gist of P. G. F.'s arguments, though it does not contain all the assumptions and statements that P. G. F. finds necessary. We, for instance, should not say that "since the advent of man a great change seems to have come over the animal creation. That prolific activity of the cosmic spirit which distinguished the first period, resulting in the production of such an amazing variety of animal forms, appears to have relented after that event." Or again, "some force or vital principle appears to have left the animal and passed into the human nature, which conferred on the latter the capacity of developing into the higher form of life, and the loss of which deprived the animal nature of the same capability." The author does not attempt to prove these propositions, and we can find no warrant for them. Such passages, which are not few, suggest that the writer's acquaintance with the facts of nature is derived from controversial literature similar to his own essay.

THE SEQUENCE OF EVOLUTION.

THE WHENCE AND THE WHITHER OF MAN: a brief History of his Origin and Development through Conformity to Environment. By John M. Tyler. 8vo. Pp. 312. New York: Charles Scribner's Sons, 1896. Price $1.75.

THIS little volume, by the Professor of Biology in Amherst College, contains the course of Morse Lectures delivered at Union Theological Seminary in the spring of 1895. The ten chapters, representing as many lectures, are of an elementary and popular character; and they will prove both entertaining and instructive to the general reader who desires to know the present position of the doctrine of evolution. The professor's main idea is, that the broad outlines in the development of the world of life can be determined by tracing the "sequence of dominant functions" or "of physiological dynasties" presented by organisms as they are followed through time. This sequence "can be traced with far more ease and safety, not to say certainty, than one of anatomical details. The latter characterise small groups, genera, families, or classes; while the dominant function characterises all animals of a given grade, even those which through degeneration have reverted to this grade. Even if I cannot trace the exact path which leads to the mountain-top, I may almost with certainty affirm that it leads from meadow and pasture through forest to bare rock, and thence over snow and ice to the summit; for each of these forms a zone encircling the mountain. Very similarly I find that, whatever genealogical tree I adopt, one sequence in the dominance of functions characterises them all; digestion is dominant before locomotion, and locomotion before thought. . . . The history of the development of anatomical details, however important and desirable, is not the only history which can be written, nor is it essential. It would be interesting to know the size of brain, girth of chest, average stature, and the features of the ancient Greeks and Romans. But this is not the most important part of their history, nor is it essential. The great question is, what did they contribute to human progress." The idea is carefully worked out, and the biological facts in illustration of the thesis are well selected.

The Lower Vertebrates.

The Royal Natural History. Edited by R. Lydekker. Parts 26–30. London: F. Warne & Co., 1896.

We have already referred in terms of high commendation to the admirable up-to-date "Natural History" which Messrs. Warne and Co. have placed within reach of the general public. We have now received the completion of the section devoted to vertebrate animals, and can merely endorse those expressions. The editor himself has contributed the chapters on reptiles, amphibians, fishes, and "semi-vertebrates," which are contained in the parts before us; and the coloured plates are all new, expressly designed and drawn by Mr. P. J. Smit. We should be disposed to criticise the vivid colouring of some of these illustrations, but on the whole they are very effective, while those of the wall-lizards and salmon are especially pleasing.

The chief feature in the account of the lower vertebrates is the classification of the fishes, in which Mr. Lydekker has followed the palæontologists. The "Ganoidei," as an order or sub-class, have thus disappeared, and the arrangement is approximately that of the British Museum Catalogue of Fossil Fishes, of which we reviewed a volume last June. The order of treatment of the various groups is alone different, and this we can hardly admit to be an improvement. As a concise general account of fishes, that of the "Royal Natural History" has pleased us more than any we have previously seen, and students of these animals will welcome so cheap and handy a compendium.

A Course of Practical Zoology.

Elementarcurs der Zootomie. By Drs. B. Hatschek and C. J. Cori. 8vo. Pp. viii., 104. Pls. xviii., and 4 figs. in text. Jena: Gustav Fischer, 1896. Price 6 mark 50 pf.

This course is arranged in fifteen sections, each adapted for a practical lesson of two hours' duration, and the authors vouch for the possibility of covering the ground in the time, having already worked according to the scheme for the past ten years. The course is so designed that all the observations may be made macroscopically—a fact which is to be deplored, inasmuch as it precludes the study of unicellular animals, without which no course of zoology, however elementary, can be considered complete. Moreover, the excuse given by the authors for not including a cœlenterate may be regarded by many as insufficient to warrant the omission. With these exceptions, the animals considered are mostly those which are usually dissected in zoological laboratories—viz., the freshwater mussel, snail, crayfish, cockroach, earthworm, leech, and frog. *Apus* is a welcome addition, and in furnishing an account of the anatomical structure of the salamander the authors have made an important contribution to laboratory literature, the only succinct account hitherto of the anatomy of this animal being that of Rusconi, published some forty years ago.

A book of this kind (in fact, one might say every book) must be judged according to the special object for which it is produced, and since the present work is, as expressly stated in the preface, only intended as a laboratory guide for students who are also attending a course of lectures, it is difficult, without knowing something about those lectures, to discuss its merits and demerits. Thus, the descrip-

tion of each animal is introduced by a formidable-looking table showing its systematic position. Now, were the book a guide complete in itself, one would not hesitate to condemn the practice as a violation of a most important educational principle. It is only after the student has gained a fair knowledge of the anatomy of animals that he should be shown what anatomical features may be selected for systematic purposes, and how a classificatory table can be constructed therefrom. To begin with, such a review is not only calculated to discourage the beginner by overwhelming him with a multitude of strange names, but is likely to give him a false idea of the fixity of a classificatory scheme. Since, however, it is quite conceivable, nay, probable, judging from the reputation of the authors, that the mind of the student has already been suitably prepared for these "Uebersichten" in the lecture course, we say nothing. The book is illustrated by eighteen folding plates, carefully drawn and free from all confusing detail. The figures, which with very few exceptions are original, are printed in black, and the names of the parts written, with but slight abbreviation, in brown ink. Both text and figures are remarkably free from errors, although it might be pointed out that in the *Anodonta* the lower of the two anterior retractor muscles is more usually known as the "protractor pedis," that the duplicity of the nerve cord of the crayfish in Taf. xii., fig. 2, might with advantage be more clearly indicated, and that an unfortunate slip has occurred in the numbering of the segments of the earthworm in Taf. xvii., fig. 7. On the whole, the book should commend itself to teachers of elementary practical zoology. W. G. R.

A Zoology for Practical People.

TEXT-BOOK OF ZOOLOGY. By J. E. V. Boas; translated by J. W. Kirkaldy and E. C. Pollard. Pp. xviii., 558, with 427 figures. London: Sampson, Low, 1896. Price 21s.

THIS text-book has already appeared in two Danish and two German editions. The second German edition was reviewed in NATURAL SCIENCE, vol. v., no. 30, p. 142, August, 1894. The translators have adhered faithfully to the plan of the original work, though there are certain differences between the English and German texts, as the book before us has been thoroughly revised by the author.

It is divided into two parts. The first or general part deals briefly with histology, fundamental form, affinities of animals. Then, in a series of short essays, such questions as "Parasitism," "Duration of Life," "Protective Adaptation," and "Geographical and Geological Distributions" are dealt with. The second or special part is systematic. Here, as all through the work, it is evident that Dr. Boas wishes his students to be naturalists, rather than mere laboratory or lecture-room scholars. In the German edition the description of the groups are followed by lists of familiar German species. These have been admirably replaced in the translation by similar lists of common British species. The illustrations are clear and suggestive, and, on the whole, good, though somewhat unequal. Certain desirable additions and improvements have been made on the figures in the German edition. The form of the book, printing, and indices leave nothing to be desired.

The addition of references to special works or original papers would, we think, greatly enhance the value of this book, as a guide in the subject of zoology both for the student and the general reader.

English students have to thank the translators for making

accessible to them a text-book which is at once comprehensive yet simple, and, as we have said before of the German edition, better than any English text-book or translation of similar scope. The translators, in their preface, observe that Dr. Boas gives prominence to facts rather than to theories. Must we not have the proverbial straw, not to mention the actual clay, before we can make bricks?

The Names of the Foraminifera.

An Index to the Genera and Species of the Foraminifera. By Charles Davies Sherborn. Part 2 (Non. to Z). From Smithsonian Miscellaneous Collections, vol. xxxvii. (no. 1031). 8vo. Pp. i.–iv., 241–488. Washington: Smithsonian Institution, 1896.

Part one of this laborious compilation was reviewed in Natural Science for May, 1894. The appearance of the second, and concluding part, allows us to repeat what we then said. The book is invaluable to the student of the Foraminifera, and we learn from the preface the true purpose of the author in spending so many years on its production. Mr. Sherborn points out that many authors take up the description of the Foraminifera without the adequate knowledge necessary, and without the facilities desirable for a proper study of the literature. By the publication of this Index to the works of all authors between 1565 and 1888, he has made it imperative for all those who write to examine carefully that which has been done before their time. There can now, therefore, be no excuse for any author to publish as new, old and well-known forms. We sincerely hope the ideal set forth will be realised; many authors, now-a-days, are only too keen to make "types," and whether they are valid or not is quite a secondary matter to them.

This part of the Index opens with the conclusion of *Nonionina*, and includes, of course, the difficult genera, *Nummulites*, *Orbitoides*, etc. The preface is admirably short, and calls attention, among other matters, to the method of quotation employed, viz., that of adding the name of the original authors to every reference. For instance, Mr. Sherborn says that great trouble is often caused by quotations like "*Cristellaria cultrata*, Brady, Report 'Challenger,' etc.," when really "*Cristellaria cultrata* (Montfort), Brady, etc.," is meant; a trouble we have often ourselves experienced.

That no labour has been spared in rendering this work complete is shown by the five pages of additamenta and corrigenda, and we offer our congratulations to Mr. Sherborn on the publication of a work which has been on his hands eleven years, and thank the Smithsonian Institution for giving it to zoologists.

Serials and Announcements.

We have received nos. 8 and 9 of vol. ii. of *La Naturaleza* (Mexico, 1894, 1895). P. Maury describes *Sebastiania Ramirezii*, a new species of Euphorbiaceæ, and on it some further notes are given by J. Ramirez. A. Dugès communicates an account of *Hemichirotes tridactylus*, as well as some descriptions of new species of *Trombidium* and *Sphæroma* by Messrs. Trouessart and A. Dollfus. A new species of *Pterostemon*, one of the Rosaceæ, is described by J. Ramirez. E. Ordóñez describes a fragment of granitic rock found in the volcano Ceboruco, and A. Dugès figures a fossil footprint from the Upper Pliocene or Pleistocene of San Juan de los Lagos, which he ascribes to a large species of *Felis*, different apparently from the ordinary *Felis concolor* of Mexico.

J. N. Rovirosa describes various vascular cryptogams and other plants, collected by him in Mexico and Chiapas. *Mocinna heterophylla*, of La Llave, one of the Papayaceæ, is re-described and figured by J. Ramirez. In both parts the Flora Mexicana of Mociño y Sesse is continued. This is a work that has remained in manuscript for about a century, and is now being published for the first time. Its botanical value is naturally not great; but it is possible that it may throw light on some questions in the history of botany, since some specimens on which it was based were, we believe, sent to De Candolle.

The Society "Antonio Alzate" of Mexico sends us vol. ix. of their *Memorias*. Besides A. L. Herrera's paper, "Hérésies taxinomistes," to which we have already alluded (vol. viii., p. 5, Jan., 1896), there are several letters on this paper from various authors, as well as quotations on the subject of nomenclature. Mr. C. T. Hudson writes:—"Of course, vanity is at the bottom of it all. My remedy is a simple one, I *neither* buy nor read these books. I am content with studying the live plants and animals about me, and their names are *the last thing* I want to know. . . . It is a good idea to make placemen or stamp-collectors of these pestilent species-makers; I wouldn't hang the poor wretches." Professor Herrera has another lively paper, a study in comparative philosophy, entitled "The Animal and the Savage," greatly to the advantage of the former. With D. Vergara Lope he has a paper on the atmosphere of great heights, and the latter author writes also on mountain sickness.

There also comes to us the *Actes de la Société Scientifique du Chili*, 5e annee, livr. 1, 2, 3, and 4, Santiago, 1895-96. We are not surprised to find the ubiquitous Mr. Cockerell describing even here new species of Coccidæ. F. Lataste has some natural history notes on Cicadas, and tells us how to catch them by clapping the hands to the time of the insects' song. C. Emery continues his description of Chilian ants, many of which are new. A. Giard describes abnormal nervation in the wing of a specimen of *Pterodela*. A. F. Nogues describes the lignite beds of the south of Chili, and concludes that the so-called Arauco group is equivalent to the Laramie and Chico-Tejon beds of North America. He also has an article strongly urging the construction of a detailed geological map of Chili: those at present in existence are old and incomplete, and Chili compares ill in this respect with other civilised countries. It appears, however, that sufficient money is not usually forthcoming from the Government to pay for scientific works of this kind. F. Gautier tells how the Indians of Bolivia eat a white clay, though not to such an extent as to cause such evil consequences as are seen among some African tribes. C. Pérez Canto describes two new cetaceans from Chili, under the names *Phocæna albiventris* and *P. philippii*. Many other papers of much interest are included in this volume.

The *Scottish Geographical Magazine* for July contains an interesting *resumé* of the papers which Drs. P. and F. Sarasin have contributed to the *Zeitschrift* and the *Verhandlungen der Gesellschaft fur Erdkunde zu Berlin*, during the last three years, on their explorations in Celebes, an island which hitherto has been but little explored. They have obtained a large amount of information regarding the physical features of the island, and its geology, its fauna and flora, and the habits and customs of its natives. In giving an account of the eleventh Swiss Geographical Congress, V. Dingelstedt says that R. Pictet has been studying the effect of the sun's heat in forming sand-spouts in Egypt. He suggests that the heat might be employed in raising the water of the Nile for the irrigation of Egypt. This might be effected by covering a

large area with blackened plates of sheet-iron, under which water would be conducted. This water, as shown by his observations, would be raised to a temperature of 150° F., some 80° higher than that of the Nile. A boiler thus constructed over 2½ acres would develop 2,000 horse-power, by which the water of the Nile might be raised to the necessary height and poured in abundance over the desert land.

We find that the remarkable paragraph entitled "Four-legged Birds," to which we recently drew attention as going the round of the English popular Press, was lifted verbatim from an article, adorned by a striking illustration, that appeared in *Popular Science News* for February, 1896. This, which is published in New York, is an illustrated monthly, in which many curious articles of a like character may be found.

An up-to-date address-book of botanists has been a desideratum for some time. One is now published by J. Dörfler, Barichgasse, 36, Vienna, III., at the price of 10 M. Despite the numerous errors, which the botanists themselves can easily correct in time for a second edition if they will take the trouble, the directory is a great improvement on any that have previously appeared.

We have much pleasure in drawing the attention of those of our readers who are interested in ornithology or anthropology to a book that is being prepared by our esteemed contributor, the Rev. H. A. Macpherson. It is entitled "A History of Fowling: being an account of the many curious devices by which wild birds are or have been captured in different parts of the world." It is believed to be an almost exhaustive treatise, and contains much new information from most regions, as well as being a digest of what has been published, especially as regards old and rare Italian works and other recondite sources. The MS. is ready, but has not yet been sent to the printers, since the author desires to ensure himself against losing much on the actual printing and engraving. The volume will be a quarto of about 450 pages, and the price is one guinea to subscribers in advance. If sufficient support be obtained by the author, he will hope to figure specimens of such ethnological interest as traps from Borneo, Morocco, Japan, India, and other parts of the world. Mr. Macpherson's other books have shown that he is well fitted to deal with a subject of such general as well as special interest, and we hope that many will send their subscriptions to him at 11 Victoria Place, Carlisle.

Literature Received.

New Mammals from Mexico, E. A. Mearns: U.S. Dept. Agric. Handbook of British Birds, H. K. Swann: John Wheldon. Der Lichtsinn Augenlose Tiere, W. A. Nagel: Jena, Fischer. What it costs to be vaccinated, J. Collinson: Humanitarian League. A Geographical History of Mammals, R. Lydekker: C. J. Clay. Official Guide to Norwich Castle Museum, T. Southwell: Jarrold and Sons.

Anableps, S. Garman: *Amer. Nat.* Leucosolenia variabilis, E. A. Minchin: Royal Society. Earliest Record of Arctic Plants, Holm: Biol. Soc., Washington. Label List British 5-banded Shells, J. T. Carrington. 45th Annual Report: Birkbeck Bank. 1st Report on Flora, Evan Nelson: Wyoming Exp. Station. President's Address: *Lin. Soc. N.S.W.* Tertiary Polyzoa of Victoria, P. H. MacGillivray: *Trans. Roy. Soc. Vic.* Lead and Zinc Deposits, A. G. Leonard: Iowa Geol. Survey. *Transactions Manchester Micros. Soc.*, 1895. Intermediate Fluke, W. Fielder, 3rd Notice.

Nature, June 18, 25, July 2, 9. Literary Digest, June 6, 13, 20, 27, July 4. Revue Scientifique, June 13, 20, 27, July 4, 11. Irish Naturalist, July. Naturen, June. Nature Notes, July. American Journ. Science, July. Naturæ Novitates, June. Amer. Naturalist, July. Science, June 19, 26, July 3. Scott. Geogr. Magazine, July. The Naturalist, July. Westminster Review, July. Botanical Gazette, June. Popular Science News, July. Knowledge, July. Photogram, July. Psychological Review, July. Science Progress, July. Ornithologist, July. Bulletin, 4, 5, 6, Int. Inst. Bibliographie, Brussels.

OBITUARY.

HENRY JAMES SLACK.

BORN OCTOBER 23, 1818. DIED JUNE 16, 1896.

WE regret to record the death of this well-known microscopist. Mr. Slack was educated at Dr. Evan's School, Hampstead, was a barrister-at-law, and was proprietor and editor of the *Atlas* and the *Intellectual Observer*. He erected an observatory at his residence, Forest Row, Sussex, but paid more attention possibly to the microscope, his little book, "The Marvels of Pond Life," of which a third edition appeared in 1878, showing close interest and observation. He was a warm advocate of the Sunday opening of museums; and his attachment to the cause of Liberalism and progress, and his sympathy with Kossuth, Mazzini, and others, is told in a short sketch by Mr. G. J. Holyoake, in the *Daily News*, June 27, to which sketch we are indebted for the above facts.

THERE are also announced the deaths of: W. VON HENKE, Professor of Anatomy at Tübingen University, on May 17, aged 62; F. LUDY, the coleopterist, on March 1; Dr. HOSIUS, Professor of Mineralogy at Münster, aged 70; and the ethnographer, VON IRGENS-BERGH, on May 21, at Copenhagen, aged 76. Botanists have to deplore the loss of: R. P. DELAVAY, well-known for his researches on the flora of China, who died at Yunnan in that country, on December 31, 1895, at the age of 62; Dr. G. LIEBSCHER, Professor of Agriculture and a noted investigator of plant-physiology, who died at Göttingen, on May 9, at the early age of 43; and Dr. J. LERCH, a student of the Swiss flora, who died at Couvet, Switzerland, on March 13.

NEWS OF UNIVERSITIES, MUSEUMS, AND SOCIETIES.

THE following appointments are announced:—H. J. Mackinder, to be Reader in Geography to the University of Oxford for a further period of five years; Dr. Lickfett, to be Director of the Hygienic Bacteriological Institute at Dantzig; Dr. Paul Eisler, to be Extraordinary Professor of Anatomy at Halle; Dr. M. Westermeier, Professor of Botany in Freising, to hold the same position at Freiburg University; N. B. Zinger, to be Curator at the Botanical Garden at St. Vladimir's University, Kiev; Dr. Went, Director of the Experiment-Station in Java, to be Professor of Botany in Utrecht University; Professor F. Kohl, to the Chair of Botany in Marburg University; Dr. F. Kienitz-Gerloff, of Weilburg-on-Lahn, to receive the title of Professor; Dr. Thilenius, to be Privat-Docent in Anatomy at Strassburg University; Dr. G. Fatta, to be Assistant in Palermo Botanical Institute; J. H. Maiden, to be Government Botanist and Director of the Botanic Gardens at Sydney, in succession to Charles Moore, who retires after nearly fifty years' service; Dr. Arthur Allin, to be Professor of Psychology and Pedagogy in Ohio University, Athens; Dr. Charles H. Judd, to be Instructor in Psychology at Wesleyan University; Miss G. A. Smith, to be Assistant in Botany, and Miss L. D. Wallace, in Zoology, at Smith College, U.S.A.; A. A. Heller, to succeed F. P. Sheldon as Instructor in Plant Taxonomy and as Curator of the Herbarium at the University of Minnesota. L. Dippel, Professor of Botany in Darmstadt, has retired.

L. J. PICTON, of Merton College, has been elected by Oxford University to the Biological Scholarship at Naples for the year 1896–97.

A BILL has been introduced into the House of Lords to transfer the right of patronage to the chairs of natural history and of botany in Edinburgh University, now exercised by the Crown, to the curators of patronage in the university.

THE Charing Cross Hospital Medical School has been enabled, by re-arrangement of existing scholarships and the proceeds of a special fund, to found memorials to Dr. Livingstone and Professor Huxley—both of them old students of the school. The memorial to Livingstone takes the form of an entrance scholarship of 100 guineas per annum; that to Huxley, first, of an entrance scholarship of £55, open to the sons of medical men; second, a second year's prize in anatomy and physiology; and, third, a lectureship dealing with recent advances in science and their bearing on medicine and surgery.

THE German Universities are beginning to take some notice of women. At the University of Berlin they are to be allowed to attend lectures after securing permission from the Minister of Public Instruction and from the lecturer. At Munich the great experiment is being tried of allowing a woman to attend courses in geology and palæontology. Göttingen, which apparently does not approve of the mixing of the sexes, is arranging special courses for women in botany, physics, and chemistry.

ON July 1 a new section of the U.S. Department of Agriculture was established under the title of the Biological Survey. It is intended to furnish agriculturists, horticulturists, and stock-breeders with charts showing the various areas in the United States that are suitable for the cultivation or rearing of different species of plants and animals.

WE are informed by Miss Hall, curator of the Whitechapel Public Museum, that, in order to extend its educational value, the Commissioners are willing to open the museum at any time after 9 a.m. to teachers who may desire to bring their classes for practical demonstration. Two days' notice previous to the visit should be sent to the curator.

THE Geological Rooms in the museum at Peel Park, Salford, which have been re-arranged by Mr. H. F. Bolton, as we described in our February number, vol. viii., p. 140, were opened on July 1, upon which occasion an explanatory address was given by Mr. Bolton.

THE ninth general Report of the Museum and Free Library of Bootle shows that the use of both institutions by the public continues to extend. Mr. H. Chadwick, the newly-appointed assistant-curator, has been arranging the mammals with a view to instruction as well as pictorial effect. He has also prepared drawings illustrating the anatomical characters of the various classes of Invertebrata. During the winter nine free addresses, illustrated by the lantern, were delivered in connection with the natural history objects in the museum. The attendance was satisfactory, and consisted chiefly of young people.

THE palæontological collections of the Musée d'Histoire Naturelle in the Jardin des Plantes are undergoing re-arrangement in a large new gallery recently erected for their reception and still unfinished. This gallery is lofty and very well lighted, and is in every way worthy of the important collections to be exhibited in it. In the central portion will be placed the larger objects, such as the magnificent skeletons of *Hipparion* and *Mastodon* from Pikermi, the skull of *Steneosaurus heberti*, and many other famous specimens. Round the walls are arranged a series of cases for the reception of smaller objects. These cases are entirely constructed of iron and glass, and are of such a height that the whole of their contents can be easily seen, a distinct improvement on the lofty cases used at the Natural History Museum, London, although, on the other hand, less convenient for the study of smaller fossils than the table-cases employed in the last-mentioned institution.

THE Committee of the Albany Museum, Grahamstown, Cape of Good Hope, sends us the *Report* for 1895, written by Dr. Schönland. It complains that the buildings are by no means well adapted either for the proper exhibition of the specimens or for their safe protection, while no use can be made of the collections for educational purposes. Dr. Schönland has been experimenting with formalin as a substitute for spirits of wine; he prefers it because it preserves the specimens better, is cheaper, and, in the weak solutions required, non-inflammable; he only fears that it may not keep in the hot climate. So far as the acquisition of specimens is concerned, the museum is progressing favourably, and the number of persons from all parts of South Africa seeking for information on the various subjects embraced by the collections is steadily increasing. Dr. Schönland's labours are so appreciated by his Committee that they have raised his title from that of Curator to Director of the Museum.

Apropos of formalin, Mr. Haly, the Director of the Colombo Museum, Ceylon, states that it is as injurious to bright colours as alcohol, and therefore does not supersede the gum and glycerine and carbolised oil methods at present employed. This building also seems to require extension, as well as another water-hose. Lists of many species of shells, Hymenoptera, moths, and Diptera contained in the museum are given; but Mr. Haly seems to be a little bit taken aback by the revolutionary changes that are being made in scientific nomenclature by such works as Boulenger's "Catalogue of Fish" and "The Fauna of British India," while mention of "Das Tierreich" suggests to him that any further compilation of lists on his part is quite useless. We do not think that Mr. Haly need be afraid that "Das Tierreich" will be completed for many years to come; at all events, if it be completed as rapidly as he seems to expect, its value will not be great.

MR. FREDERICK CHAPMAN has been elected an Associate of the Linnean Society, as a recognition of his work on the Foraminifera. We are glad that Mr. Chapman has been so honoured, for we are inclined to value the A.L.S. highly, as, unlike the fellowship of other societies, it cannot be bought.

PROFESSORS W. G. RÖNTGEN and K. V. Kupffer have been elected Corresponding Members of the Royal Prussian Academy of Sciences.

THE delegates to the International Conference on the Bibliography of Science, with other invited guests, were received by the President of the Royal Society at Burlington House, in the evening of Monday, July 13, and began their serious discussions the next morning. On Tuesday evening they dined together at the Hotel Metrôpole, the following day were received at the Mansion House, and on Thursday attended a garden party given by Mr. and Mrs. Ludwig Mond, where the beautiful entertainment was hardly spoilt by the unfavourable weather. Since the meetings of the Conference were strictly private, we are precluded from reporting the discussion, but we understand that it has been decided to establish a Central Bureau, having its headquarters in London, and separate National Bureaux for each state concerned. The National Bureaux will undertake the work of cataloguing the literature, each for its own country, and of transmitting this preliminary catalogue to the Central Bureau, which will prepare it for publication in final slip- and book-form. As regards the further questions of organisation, language, and system of classification, these are, for the present, referred to an organising committee, to be appointed by the Royal Society, which will enquire into the various questions, possibly experimenting in some manner, and which, when it has arrived at certain conclusions, will convene another conference, the date of which is not to be later than January, 1898. It is, we believe, decided that the titles of all papers shall be quoted in the original language, but that certain languages, as yet undecided, shall also be translated into some more familiar tongue.

A CIRCULAR of invitation to the Seventh International Congress of Geologists has been issued by the Russian Organising Committee. The Congress will take place at St. Petersburg, towards the end of August, 1897, under the honorary presidency of the Grand Duke Constantine, and the acting presidency of Dr. A. Karpinsky, Director of the Geological Committee of Russia. The General Secretary is Professor Th. Tschernyschew. The session will last about a week, and the proceedings of the Congress will not be distributed among sections, as at Zurich, but will be devoted to the discussion of various broad principles. Some communications, however, will be made with reference to the important geological studies and explorations now being carried on in Russia. For those geologists who wish to read little papers on subjects interesting to themselves, it is proposed to have special meetings of various scientific societies, at which such minor matters can be discussed. Numerous excursions are announced:—to the Ural Mountains, to the Volga, to Esthonia, to Finland, etc. After the Congress a long excursion will be made, first to Moscow, where it will divide into three parts, one going to the basin of the Donetz, the second to Nijni-Novgorod, and the third to Kiev; meeting again, the members will proceed to Tiflis, Bakou, Batoum, Kertch, and various parts of the Crimea, ending at Sebastopol. Among other places that may be visited as variants from this excursion are the Caucasus and Mount Ararat. Those geologists who intend to go on any of these excursions should send notice before October to the Secretary, when they will receive a detailed plan of the excursions, with an approximate estimate of the expense. The latter item will be greatly lessened by the gracious act of His Majesty the Czar in granting to all geologists who shall, in due time, have intimated their intention of attending the Congress, tickets giving free passage, first-class, over all Russian railways, both before and after the meeting of the Congress.

ANOTHER so-called International Congress! This time it is on sea-fishery and oyster-culture, and is to be held from September 3 to 7 at Sables-d'Olonne (Vendée),

under the presidency of Admiral Duperré and Professor Perrier. Subscriptions and communications may be addressed to Mr. A. Odin, 67 Rue du Port, Sables-d'Olonne.

THE Herpetological Society, whose foundation we announced in our February issue, published the first number of a journal under the name of *The Vivarium*, which is now quite out of print. Both society and publication, however, received so little financial support that they are in abeyance for the present.

PRIZES for essays on the following subjects are offered by the Royal Danish Academy of Sciences:—Morphological and physiological researches on the asci of the Ascomycetes; the Danish species of Nematoids and Anguillulinæ; and the life-history of those Sphæriaceæ which are destructive to cereal crops.

PROFESSORS H. T. PECK, Daniel Brinton, and H. C. Adams have been appointed a committee to adjudge the two prizes of 5,000 and 2,000 francs founded by Joseph Loubat, of Paris, to be given every five years to the authors of the best works on the history, geography, archæology, ethnology, philology, or numismatics of N. America. The next competition is in 1898.

AT a recent meeting of the Biological Society of Washington, Mr. Charles D. Walcott, Director of the U.S. Geological Survey, stated that he had completed an extensive memoir on the fossil Medusæ of the Lower and Middle Cambrian of North America and the Jurassic of Europe. It will be illustrated by numerous plates showing details of structure of many of the forms, which were preserved under very favourable conditions, and presenting also the results of experiments with living species.

A NEW zoological garden has been opened at Königsberg, in Prussia, under the directorship of Dr. J. Müller, formerly of the garden in Berlin.

A SITE of 261 acres in Bronx Park, south of Pelham Avenue, has been suggested for the new zoological park, New York, but action is postponed for the present, since Mayor Strong is opposed to granting the land. Mr. W. T. Hornaday is now in Europe inspecting the various zoological gardens.

PROFESSOR DARCY THOMPSON, who, as we announced, has gone to the Behring Sea to study the seal fishery question, is accompanied by Mr. Andrew Hackett and Professor Macoun, of the Geological Survey of Canada. The party has gone to the Prybilov Islands in the U.S. Fish Commission steamer "Albatross."

THE largest meteorite in the world, weighing forty tons, which was found by Lieut. Peary in Greenland, is to be brought back by him for the Philadelphia Academy of Sciences on his present trip. Large scientific parties are going with him. One party will make a geological study of the region near the Devil's Thumb at the south end of Melville Bay, and will collect the fauna and flora. Another will land at the Great Umanak Fiord, where it will make pendulum observations, natural history collections, and study the glacial phenomena. Peary himself will proceed north as far as Cape Sabino, and will also try to explore Jones' Sound. An artist accompanies him to take casts of the Cape York natives, who, it is to be hoped, will prove amenable. The ss. "Hope," conveying the expedition, left Cape Breton Island on July 16.

A PARTY of four, under the direction of Mr. T. H. Mobley, will start from Lacomb, Alberta, to explore Northern Canada from Edmonton to the Arctic Sea. The trip is to occupy two years.

THE Conway Expedition to Spitzbergen has already conducted some successful, though difficult, explorations, and Dr. Gregory has obtained some valuable

geological results. The ice in this neighbourhood is very heavy this year, and it is thought that the "Windward" may be frozen up in Barents Sea before she can reach Franz Josef Land with her supplies for the Harmsworth-Jackson Expedition. This will affect most of the other expeditions now around the North Pole, except Andrée's balloon expedition. An interesting account of the balloon and its arrangement, by G. Tomel, is given in *Popular Science News* for July, 1896.

PROFESSOR AGASSIZ and party have returned to America from their expedition to the barrier reef of Australia. The ss. "Croydon" was chartered in Brisbane from the A.U.S.N. Co., and the reef worked from south to north. We learned from the party as they passed through London that the results were not so good as had been expected. Owing to the unfavourable weather the vessel had to lie to for considerable periods at Cooktown, Pitcairn, and elsewhere, so that only about a week of working days was found. Deep dredging became out of the question, but some captures were made with surface nets, and several photographs were taken. Professor Agassiz expressed himself as enchanted with the indescribable beauty of the corals, which surpassed that of any reefs he had previously seen.

MR. C. HEDLEY has joined the coral-reef boring expedition to Funifuti as zoologist.

MR. E. A. FITZGERALD, the climber of the New Zealand Alps, leaves England in September for Chili, where he will explore the summit of Aconcagua, 23,200 feet. Among those accompanying him is Mr. Philip Gosse, and it is stated that the scientific side of the expedition will be as perfect as it can be made, nearly £4,000 being spent in completing the preparations.

DR. M. RACIBORSKI, of Munich, has been sent to the Buitenzorg Botanical Gardens.

PROFESSOR V. F. BROTHERUS, of Helsingfors, has gone to Central Asia to work out the bryological mountain flora of Issikul.

THE Japanese Parliament has voted a sum of 5,383 yen (about £675) for the scientific exploration of Formosa by members of Tokyo University.

A STATE Entomological Experiment Station, for which the money has been voted by both Chambers, is to be built near Stockholm.

SOME important deposits of brown coal have recently been discovered in South-west Russia, near the Fastov Railway, and a company is being formed in St. Petersburg to work the same; true coal has also been found in many parts of Western Siberia, in the Governments of Yeniseisk and Irkutsk, in the provinces of Yakoutsk, Trans-Baikal, the Amour, in the Maritime Province, and in Kamschatka. The most important deposits are those in the Maritime Province, which is the only one in which mining operations are carried on. Seams of good coal have been found near Spickholzerteide, in South Limburg, Holland, and will be worked by a Dutch-Belgian company. For some time a company known as the Budapest Regional Coalmining Industry Company has been boring for coal at Vorosvar, Hungary. It is now reported that a thick seam of coal has been cut through at a depth of about 273 yards.

MUST not palæontology in the United States be in rather a bad way if it is necessary for Professor G. D. Harris, the editor of the *Bulletins of American Palæontology*, to offer a prize of $50 for a monograph suitable for publication, to be presented before May 1, 1897? Whatever be the reason for this move, the energy of Mr. Harris deserves commendation.

CORRESPONDENCE.

The New Fittings for the South African Museum.

In your abstract of the Report of the Trustees of the South African Museum for 1895 (antea p. 66) you mention that the air-tight iron and glass cases, on my system, for the new building in Cape Town, are to be supplied by Chubb & Sons' Safe Company. I beg to state that this London firm has ordered the said fittings in Dresden, but, unfortunately, from a manufacturer who is not up to date in this respect. Since my last publication (in the year 1892) on this matter, which has been reported also by you (vol. v., p. 14, 1894), I have, with the help of an exceedingly clever member of the firm of Messrs. Herrmann & Ranft, in Dresden, hit upon some very essential improvements, which alter the aspect of these fittings, cases as well as desks, much to their advantage. I regret that I have not yet found leisure to publish anything about this progress (though I hope to be able to do so still in the course of this year, with the necessary figures for illustration), and that, in consequence, the South African Museum will receive fittings after a system given up by myself several years since, and which I, for my part, would not advocate any longer, since "the better is the enemy of the good."

Royal Zoological Museum, Dresden. A. B. Meyer.

July 2nd, 1896.

The Cause of the Mammoth's Extinction.

In Professor Bonney's review of Dr. Gregory's valuable work (Natural Science, vol. ix., pp. 53–57) reference is made to the discovery of large quantities of bones of animals lying exposed on the surface in Eastern Africa, unweathered and ungnawed, and it is suggested that in some way or other these bones illustrate the well-known cachés and deposits of bones which date from Pleistocene times and which have occupied me much, and I am reminded of the analogy by Dr. Bonney.

The fact was familiar enough to me as existing elsewhere. Darwin has a very interesting reference to similar collections of bones in South America. My brother-in-law, who has long had a cattle ranche in New Mexico, tells me that seasons of great drought there are always followed by similar phenomena. The buffalo plague in South Africa left similar mementoes, while not long ago Mr. Wylde at my own table described the terrible sights he had seen on the plains of the Eastern Soudan, where 200,000 skeletons lay exposed on the ground, the result, not of drought, but of Martini rifles. Similar deposits to these are referred to in my Mammoth book, but I have there protested, and I propose to protest again, against there being the smallest analogy between them and the Pleistocene buried bones.

In the first place, the series of these buried bones is really conterminous with the Siberian deposits, where the flesh and soft parts of the animals are preserved. The two conditions of the preservation of these latter are that they have remained frozen since they were deposited, and that they were buried and protected from weathering directly after they died, and have remained covered in ever since. The latter condition applies to all the cases where whole skeletons have been found with their several bones in position, which has happened in many places, as I have shown, from the Pyrenees to the Yellow Sea.

It is true that the bones exposed on the African plains remain ungnawed, largely because they have been stripped of their flesh by raptorial birds which cannot gnaw bones. It is true also that they remain for a year or two with their edges sharp, but this condition is very short-lived, the rain and the sun speedily disintegrate and weather them.

In the case of the Pleistocene bones, we know that they remained not only ungnawed, but with their fleshy covering uneaten until it decayed away, while the bones remain as fresh to-day after thousands of years as they were when the animals died, and without the slightest trace of weathering. This is, in itself, a very great distinction. A greater remains in the fact that the Pleistocene bones are buried deep in gravel or brick earth, and do not lie on the surface, and they must have been buried when the carcases were intact, for the bones are all in place. They are buried not merely on river bottoms, but over immense stretches of undulating country in Eastern Europe and Siberia, are chiefly *found where the ground is highest*, and are covered by vast continuous mantles of gravel, etc., in countries where the rivers carry no gravel, and where, when they flood the country, they leave scarcely a trace of warp. All this I have urged in great detail elsewhere, and it has to be accounted for. What single point of contact does it present with the scattered bones on African plains after a drought, or the myriads of dead seagulls on our coasts after some portentous storm ?

Again, all these cases and similar ones are quite local, dependent on local circumstances, local droughts, local murrains, etc., etc., but in the case of the Pleistocene beasts the problem which has to be explained covers three continents. We may start from Italy and Southern France, traverse every degree of longitude till we reach Behring Straits, and find the same phenomenon presenting the same conditions; and if we cross Behring Straits to Alaska, we may begin another journey which shall carry us right down to Patagonia. Everywhere, so far as the evidence goes, we have traces of the same stupendous hecatomb of beasts buried under similar continuous mantles of loam and gravel, and for the life of me I cannot see, any more than Darwin could see, how the phenomenon of the Pampas is to be separated in date or in kind from the phenomenon of the Russian plains. Darwin himself confessed that he was baffled in trying to explain the difficulty, and so must every man be baffled who starts with hypotheses and then turns to the facts Deductive methods must be barren in a science like geology. To start with a magnificent postulate about uniformity, and to attempt to squeeze any part into that straight jacket is not science. It may be metaphysics, but metaphysics is not a fruitful tree. Nor may I say is it fruitful to attempt to correlate the local phenomena following a drought in Africa with continental phenomena derived from droughtless regions, which, as I have shown, differ so essentially in every particular from them, as do the conditions under which the bones in the great Pleistocene graveyard were accumulated.

Yours most obstinately,

30 Collingham Place, Earl's Court. HENRY H. HOWORTH.

THE NAME OF THE GORILLA.

ON p. 31 of your last number Dr. Arthur Keith comments on the name *Anthropopithecus gorilla* affixed to the gorilla's cage in this Society's Gardens, and asks who is responsible for it. I may state in reply that I am responsible for all the names given to the animals in the Zoological Society's Gardens. Dr. Keith appears to prefer the name *Troglodytes gorilla*, but if he will refer to Flower and Lydekker's "Mammals Living and Extinct" (p. 736) he will find the reason stated why the term *Troglodytes* cannot be used.

I may add that all the names employed in the labels used in the Society's Gardens will be found to correspond with the list of the animals in the Gardens published in 1883, which was prepared mainly with the view of ensuring uniformity in the nomenclature.

Zoological Society of London, P. L. SCLATER.
3 Hanover Square, London, W.
July 7th, 1896.

A PLEA FOR THE PRELIMINARY SINNER.

IT is not without much hesitation that I venture to appear in NATURAL SCIENCE as a defender of the "preliminary notice," and I am quite prepared to undergo the process which on this side of the water is styled being "jumped on with both feet."

Nevertheless, I cannot look upon the preliminary notice as an unmitigated evil, nor consider the writer thereof as utterly lost to all sense of scientific decency. This is very likely because I am, to some extent, myself one of the sinners and wish to be forgiven not only for past sins, but, like Louis XI., for one little sin more, that I hope to commit ere long.

The object of the preliminary paper is to render immediately available facts which would otherwise remain unknown for an indefinite time, to protect the worker from having the cream of his labour skimmed off by someone who has been but a brief time in the field, and to place the credit for work or discoveries where it justly belongs. Consider, for example, Dr. Stejneger's recent paper on the blind amphibian *Typhlomolge*. It will undoubtedly be two or three years before a detailed description of the species, fully illustrated, and properly compared with other forms, can be issued, and, but for the preliminary notice, the credit of the discovery of the interesting little beast, and the recognition of its affinities, would undoubtedly have been claimed by another. And yet, had this happened, such a paper, so far as results are concerned, would have been just as preliminary in its character as that of Dr. Stejneger, besides having the added evil of depriving another of his just dues.

Again, the U.S. National Museum is the possessor of some remains of *Zeuglodon* which will form the basis of an illustrated memoir. Pending the publication of this, it is purposed to publish a preliminary paper giving the characters of the family and genera and probable affinities. This will render the main facts in the case of *Zeuglodon* at once available, while, from the nature of the work, it will be *at least* two years before it will be possible to publish in detail the results of the study of this material together with the figures which will practically place the specimens at the disposal of everyone. Shall we stay our hands—and preliminary notes—and bottle up the information so far as possible, or shall we do the best we can now and do better later on?

There are doubtless some happy individuals, not hampered by the cares of the world, who can prosecute their work without interruption and publish it without delay, but there are also people whose work is subject to numerous interruptions, and who consider it great good fortune to have a paper published within a year of its completion. And to these unfortunates the preliminary notice comes as a means of saving grace—and credit—and it is a little hard to say that there is no good in them—or in their paper.

Not that the mantle of charity should be spread over the shoulders of every preliminary paper; for there are many that should be treated as outcasts and turned out into the cold. But there are papers and papers, and it seems to me eminently proper to allow a man to secure his main facts with a preliminary nail, and then sit down and work in peace.

Washington, D.C. F. A. LUCAS.

[We do the "jumping on" Mr. Lucas in our Notes and Comments.—Ed. NAT. SCI.]

NOTICE.

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